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(12) KOKAI TOKUHYO PATENT GAZETTE (A)

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(71) Applicant: 000002185
Sony Corp, 6-7-35 Kitashinagawa, Shinagawa-ku, Tokyo

(72) Inventor: Keitaro Yamashita
Sony Corp,
6-7-35 Kitashinagawa,
Shinagawa-ku, Tokyo

(74) Agents: Atsuo Waki, patent attorney,
and 1 other

(54) [Title] TRANSMISSION AND RECEPTION SYSTEM, RECEIVING EQUIPMENT, AND TRANSMITTING EQUIPMENT

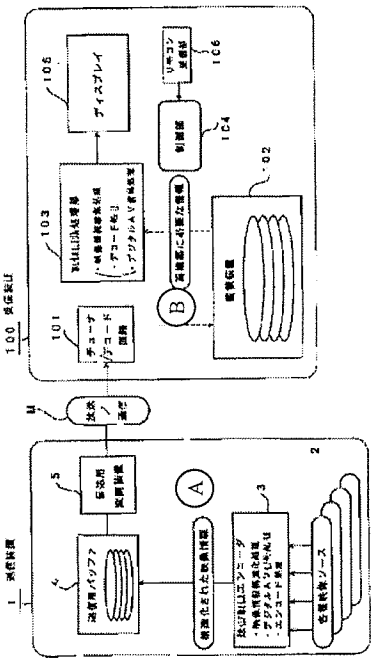
(57) Abstract

Problem

To provide a picture with content corresponding to a requested viewing form that is different for each viewer while restraining the program production cost.

Means to solve

The video information of a program on the side of transmitting equipment 1 is hierarchized by scene group and scene unit, and structured video information is formed by setting an index screen and a digest screen to broadcast the program. On the side of receiving equipment 100, video information stored in storage device 102 is read out in a structuring video information unit as preferred by the viewing form of the viewer and is edited by video editing part 103. The edited program formed this way is displayed on display 105 so that it is possible to view a picture with content corresponding to the viewing form requested by the viewer.



Key:
A Structured video information
B Information needed for restructuring
M Broadcast/communication
1 Transmitting equipment

2	Various kinds of video sources
3	Transmitted picture encoder · Video information structuring processing · Digital AV signal processing · Encoding processing
4	Buffer for transmission
5	Modulator for transmission
100	Receiving equipment
101	Tuner/decoder
102	Storage device
103	Video editing part · Video information editing · Decoding processing · Digital AV signal processing
104	Control part
105	Display
106	Remote control receiver

Claims

1. A transmission and reception system characterized by the fact that it is constituted by

transmission equipment equipped with a structuring means, which performs structuring processing appropriately so that video information in a prescribed unit can be hierarchically managed in a structuring unit depending on prescribed levels in accordance with prescribed meanings, and a transmission means, which can transmit structured video information managed in the aforementioned structuring unit; and

receiving equipment equipped with a reception means that can receive said video information, a storage means that can store the video information received by said reception means, and an editing means that can read out the video information stored in said storage means and use said structuring unit to edit the video information.

2. The transmission and reception system described in Claim 1 characterized by the fact that said structuring means is constituted such that it can set a group structuring unit formed by integrating plural specific structuring units in accordance with prescribed meanings as said structuring unit and can divide the video information of said prescribed unit by said group structuring unit, and

said editing means can edit the video information using said group structuring unit.

3. The transmission and reception system described in Claim 1 characterized by the fact that said structuring means can set a typical still image representing the content of the video information with respect to the prescribed structuring unit as said structuring unit and can perform structuring processing appropriately so that the typical still image becomes manageable, and

said editing means can edit the video information using said typical still image unit.

4. The transmission and reception system described in Claim 1 characterized by the fact that said structuring means can set a typical moving image representing the content of the video information with respect to the prescribed structuring unit as said structuring unit and can perform structuring processing appropriately so that the typical moving image becomes manageable, and

said editing means can edit the video information using said typical moving image unit.

5. Receiving equipment characterized by having

a reception means that can receive transmitted video information in a prescribed unit,

a structuring means that performs structuring processing appropriately so that the video information in the prescribed unit received by said reception means can be hierarchically managed in a structuring unit depending on prescribed levels in accordance with prescribed meanings,

a storage means that can store the video information that can be managed in said structuring unit, and

an editing means that can read out the video information stored in the storage means and edit the video information using said structuring unit.

6. The receiving equipment described in Claim 5 characterized by the fact that said structuring means is constituted such that it can set a group structuring unit formed by integrating plural specific structuring units in accordance with prescribed meanings as said structuring unit and can divide the video information of said prescribed unit by said group structuring unit, and

said editing means can edit the video information using said group structuring unit.

7. The receiving equipment described in Claim 5 characterized by the fact that said structuring means can set a typical still image representing the content of the video information with respect to the prescribed structuring unit as said structuring unit and can perform structuring processing appropriately so that the typical still image becomes manageable, and

said editing means can edit the video information using said typical still image unit.

8. The receiving equipment described in Claim 5 characterized by the fact that said structuring means can set a typical moving image representing the content of the video information with respect to the prescribed structuring unit as said structuring unit and can perform structuring processing appropriately so that the typical moving image becomes manageable, and

said editing means can edit the video information using said typical moving image unit.

9. Transmitting equipment characterized by having

a structuring means that performs structuring processing appropriately so that video information in a prescribed unit received by said reception means can be hierarchically managed in a structuring unit depending on prescribed levels in accordance with prescribed meanings,

an editing means that can construct video information in a program unit by editing the video information structured in a manageable manner in said structuring unit by said structuring means depending on said structuring unit, and

a transmission means that transmits the video information of the program constructed by the editing means and assigns the video information to respective prescribed channels.

10. The transmitting equipment described in Claim 9 characterized by the fact that said editing means can input request information that requests desired program content and is sent from the side of receiving equipment that can receive video signals transmitted from said transmitting equipment, and

the aforementioned video information is edited appropriately to form a program having content suitable for said request information.

11. The transmitting equipment described in Claim 9 characterized by the fact that

said structuring means is constituted such that it can set a group structuring unit formed by integrating plural specific structuring units in accordance with prescribed meanings as said structuring unit and can divide the video information of said prescribed unit by said group structuring unit, and

said editing means can edit the video information using said group structuring unit.

12. The transmitting equipment described in Claim 9 characterized by the fact that said structuring means can set a typical still image representing the content of the video information with respect to the prescribed structuring unit as said structuring unit and can perform structuring processing appropriately so that the typical still image becomes manageable, and

said editing means can edit the video information using said typical still image unit.

13. The transmitting equipment described in Claim 9 characterized by the fact that said structuring means can set a typical moving image representing the content of the video information with respect to the prescribed structuring unit as said structuring unit and can perform structuring processing appropriately so that the typical moving image becomes manageable, and

said editing means can edit the video information using said typical moving image unit.

Detailed explanation of the invention

[0001]

Technical field of the invention

The present invention pertains to a transmission and reception system, transmitting equipment, and receiving equipment. In particular, the present invention pertains to a transmission and reception system, transmitting equipment, and receiving equipment, which can manage video information structured in accordance with prescribed meanings.

[0002]

Prior art

Currently, broadcasting systems broadcast using terrestrial waves, broadcasting satellites, communication satellites, and CATV. Said broadcasting systems usually broadcast video information in the unit of a "program." Then, a viewer possessing receiving equipment can select a desired program from the programs supplied from the transmission side, choose the channel, and watch the program.

[0003]

Problem to be solved by the invention

However, instead of watching all of the contents of a desired program, sometimes, the viewer only wants to watch a specific content or information in that program. More specifically, for example, in the case of sports news, the viewer may only want to watch a certain sport among the various sports broadcasting in the program or may only want to watch the information content of a certain team. Also, for a program of drama or a movie, the viewer may only want to obtain a summary of the program instead of watching it from the beginning to the end. Of course, the viewer can also make such a request for programs of other categories.

[0004]

However, in a conventional broadcasting system, since a broadcast is supplied in a program unit as described above, in order to satisfy side an aforementioned request regarding program content that varies depending on the viewer from the broadcasting side, the number of broadcasting programs or the number of broadcasting channels will increase significantly, which will increase the cost and the management work.

[0005]

Means to solve the problem

The objective of the present invention is to solve the aforementioned problem by providing a transmission and reception system, transmitting equipment, and receiving equipment to construct a broadcasting system that can satisfy a request of viewing form that varies depending on the viewer as much as possible at a low cost.

[0006]

Therefore, a transmission and reception system is constructed by adopting transmission equipment equipped with a structuring means, which performs structuring processing appropriately so that video information in a prescribed unit can be hierarchically managed in a structuring unit depending on prescribed levels in accordance with prescribed meanings, and a transmission means, which can transmit the structured video information that can be managed in the aforementioned structuring unit; and receiving equipment equipped with a reception means that can receive said video information, a storage means that can store the video information received by said reception means, and an editing means that can read out the video information stored in said storage means and use said structuring unit to edit the video information.

[0007]

The present invention also provides receiving equipment equipped with a reception means that can receive transmitted video information in a prescribed unit, a structuring means that performs structuring processing appropriately so that the video information in the prescribed unit received by said reception means can be hierarchically managed in a structuring unit depending on prescribed levels in accordance with prescribed meanings, a storage means that can store the video information managed in said structuring unit, and an editing means that can read out the video information stored in the storage means and edit the video information using said structuring unit.

[0008]

The present invention also provides transmitting equipment equipped with a structuring means that performs structuring processing appropriately so that video information in a prescribed unit received by said reception means can be hierarchically managed in a structuring unit depending on prescribed levels in accordance with prescribed meanings, an editing means that can construct video information in a program unit by editing the video information structured in a manageable manner in said structuring unit by said structuring means depending on said structuring unit, and a transmission means that transmits the video information of the program constructed by the editing means and assigns the video information to the respective prescribed channels.

[0009]

Said structuring means is constituted such that it can set a group structuring unit formed by integrating plural specific structuring units in accordance with prescribed meanings as said structuring unit and can divide the video information of said prescribed unit by said group structuring unit, and said editing means can edit the video information using said group structuring unit. Also, said structuring means can set a typical still image representing the content of the video information with respect to the prescribed structuring unit as said structuring unit and can perform structuring processing appropriately so that the typical still image becomes manageable, and said editing means can edit the video information using said typical still image unit. In addition, said structuring means can set a typical moving image representing the content of the video information with respect to the prescribed structuring unit as said structuring unit and can perform structuring processing appropriately so that the typical moving image becomes manageable, and said editing means can edit the video information using said typical moving image unit.

[0010]

For example, when the structure of one program is under consideration in the content aspect, if a scene unit reflecting a certain content is defined as a "scene" and a group of scenes are defined as a "scene group" that expresses a more general content, one program can be captured as [a program] formed by structuring units hierarchized by using said "scene" and "scene group." When these scenes or scene groups are edited on the transmission side (side of the broadcasting station) or reception side (side of the viewer) to match the content corresponding to the viewing preference of the user by adopting the aforementioned configuration, "video information" can be newly formed with content satisfying a request of viewing form that varies depending on the viewer from the original content that forms a certain program. Also, if a typical screen is set by using a still image or moving image in the program and said typical screen is used to perform editing, video information with content that is sufficient to obtain a summary of the program can be easily formed.

[0011]

Embodiment of the invention

An embodiment of the present invention will be explained below in the following order.

1. Structure concept of program in this embodiment
    (1-a. Scene and scene group)
    (1-b. Structure example of ID data area)
    (1-c. Index screen setting example)
    (1-d. Digest screen setting example)
2. Broadcasting system example as this embodiment
3. Method of recording video information to storage device

[0012]

1. Structure concept of program in this embodiment

(1-a. Scene and scene group)

In this embodiment, the processing for forming "structured video information" with respect to the video information of each program can be carried out on the side of the transmitting equipment or the side of the receiving equipment although it varies depending on the form of the broadcasting system in several examples to be described later. In this embodiment, the structuring unit of the program video information is defined as a "scene", which is a scene unit expressing a certain content for one program. The video information can be managed in a scene unit by assigning a prescribed ID to the structuring unit set as the scene unit. It is also possible to manage the video information in a scene group unit by defining a scene unit,

which expresses a more general content by integrating plural scenes, as a "scene group" and by assigning a prescribed ID to the structuring unit set as the scene group unit. In this embodiment, it is also possible to define and set an "index screen", which shows the content of a program by using a still image, or a "digest screen", which can permit comprehension the content of a program by using a still image or moving image, as the structuring unit of the program.

[0013]

First, an example of structuring a program by using scene and scene group units will be explained with reference to Figure 1. In Figure 1(a), a program having a broadcasting period with a time length of T0-T1 is shown over time t. This program is divided into scene group units set to have a certain general common content as the first level of a hierarchy. The number of divisions by scene group unit with respect to 1 program varies corresponding to the content of the entire program. In this case, as shown in Figure 1(b), the program is divided into 12 scene groups, that is, scene group A – scene group L. Each scene group is divided into scene units corresponding to differences in the content in the scene group as the second level of a hierarchy. In this case, as shown in Figure 1(c), scene group A is divided into 13 scenes, that is, scenes Aa-Am. Also, depending on the content, a scene group may be formed by one scene. For example, scene [group] I shown in Figure 1(b) is directly set as scene group [sic] Ia shown in Figure 1(c). As far as the specific relationship between said scene group and scene is concerned, for example, if the program concerned is sports news, the scene group can be divided based on a certain sports category or based on the content of news of a certain team. The scene can be divided based on the content regarding the game result, players, or other information in said sports category or team. This, however, is only an example. There is no special limitation on how to match the level (level) of the content with scene group and scene for each program. Also, each scene usually has a time duration of 0.5 sec or longer. Therefore, one scene is formed by plural fields (or frames). For example, as shown in Figure 1(d), scene Aj is formed by plural field groups of fields (Aj1-Ajn (n is a variable indicating the last field number in the scene concerned)). Scene Ia is formed by field groups Ia1-Ian.

[0014]

Structuring of the program based on scene and scene group explained with reference to Figure 1 is only an example. For example, the hierarchy structure is formed by two levels of scene group – scene in Figure 1. Hierarchization is possible using more levels or by dividing the program by only using scenes without establishing the concept of scene group.

[0015]

(1-b. Structure example of ID data area)

As shown in Figure 1, in order to manage the video information structured by using hierarchies composed at least of scenes and scene groups for a program, ID data having the data structure shown in Figure 2 are added to the structure video information. Figure 2(a) shows the structure of the ID data area wherein the ID data used for managing the structured video information are stored. Said ID data area is added for each field image, for example. In the ID data area shown in Figure 2(a), time stamp area AR1, program ID area AR2, scene group ID area AR3, scene ID area AR4, intra-scene field number area AR5, and description area AR6 are set in that order from the header position. The data length (number of bits) is set corresponding to various conditions in each area.

[0016]

The data indicating the time that has lapsed from broadcast beginning time T0 to the position of the current field corresponding to the ID data area concerned are stored in time stamp area AR1. It is also possible to store the information of date, hour, minute, second corresponding to the actual broadcasting time as data.

[0017]

The program ID data used for identifying a program and varying for each program including the current field are stored in program ID area AR2 as shown in Figure 2(b). There is also a region of program description flag F_p indicating whether there is a program description to be described later. Any program ID can be used as long as it can be used for identification in a program unit. For example, it can be a code number set differently for each program or coded information of the broadcasting date and time, broadcasting channel, or the like of the program.

[0018]

Scene group ID area AR3 has a region that stores a scene group ID used for specifying the scene group including the current field and a region of flag F_{sg} indicating the presence/absence of a scene group description to be described later, as shown in Figure 2(c). the scene group ID can be indicated by a code obtained by digitizing the sequential number of the scene group from the beginning of the program. It can also be indicated by coding the time of the beginning point of the scene group concerned with respect to the beginning time point of the program.

[0019]

Scene ID area AR4 has a region that stores a scene ID for specifying the scene including the current field and a region of flag F_{sg} indicating the presence/absence of a scene description to be described later, as shown in Figure 2(d). The scene ID can be indicated by a code obtained by digitizing the sequence number indicating the position of the current scene. It can also be indicated by coding the time information of the beginning point of the current scene with the beginning time point of the scene group used as the starting point. The relationship between the scene group and the current scene is specified by table data set separately. Alternatively, the sequence number of each scene from the beginning of the program is coded, and the relationship between the scene group and the current scene is specified by table data set separately. The datum of an intra-scene field number indicating the sequence number of the current field in a scene is stored in intra-scene field number area AR5.

[0020]

Description area AR6 is divided into program description area AR6-1, scene group description area AR6-2, and scene description area AR6-3, for example, as shown in Figure 2(e).

[0021]

The program description data used for showing a summary of the content of a program are stored in program description area AR6-1. The specific content of the program description data includes the program category (sports, variety, drama ...), program title, name of the program producer, program broadcaster (broadcasting station) name, names of the main performers, and the like that are stored based on codes following a prescribed format.

[0022]

The scene group description data used for describing the content of the scene group concerned are stored in scene group description area AR6-2. For example, if the concerned scene group is a scene group of a picture having content regarding baseball in sports news, it is necessary to at least store information indicating that the sports category is "baseball" as a code. The scene description data used for describing the content of the concerned scene are stored in scene description area AR6-3. For example, if the program is sports news and the scene is a picture having content regarding the game of a specific team, it is necessary to at least code the contents indicating the information of the team name and game result.

[0023]

Since description area AR6 is used to generally show the contents of a program, scene, and scene group as described above, there is no need to adopt it corresponding to all field images. Therefore, said program description area AR6-1, scene group description area AR6-2, and scene description area AR6-3 that form description area AR6 are added to a prescribed number of fields starting from the beginning of a program, scene group, scene, while a description area is not adopted for the remaining fields. In this way, the amount of data handled by the broadcasting system in this embodiment can be reduced.

[0024]

The form of the ID data is not limited to that shown in Figure 2. For example, an ID that can be used to identify a field is added to each field image, and a data table wherein management information corresponding to each field is stored is prepared separately. In this case, for example, it is possible to reduce the amount of data used as management information to be inserted into the image data in a field unit.

[0025]

The signal of the ID data area (ID data signal) shown in Figure 2 can be added to video/audio signals by following a prescribed rule when the video/audio signals of a program are being transmitted or when they are encoded by means of digital signal processing in a prescribed format so that they become a data format suitable for storage in a storage device. For example, the ID data signal coded as shown in Figure 2 is stored in the packet header for transmission. It is also possible to insert said signal so that it is stored with respect to the header region of each field of the video signal data as bit stream data. It is also possible to store said signal in the sector header of the recording medium of a storage device.

[0026]

On the other hand, when the ID data signal is added in the stage at which the video information of a program is composed of analog video/audio signals, it is possible to superimpose said signal with the video signals of the program as shown in Figure 3.

[0027]

Figure 3(a) shows a vertical blanking period for the video signals of a program. The ID data signal can be superimposed appropriately so that it is inserted into a prescribed horizontal scanning period (the part enclosed by broken line Q in Figure 3(b)) in the period (enlarged in Figure 3(b)) wherein the horizontal synchronization pulse enclosed by broken line P in the

vertical blanking period is obtained. Figure 3(c) shows a state in which the prescribed horizontal scanning period enclosed by broken line Q is enlarged and the ID data signal is actually superimposed.

[0028]

(1-c. Index screen setting example)

In this embodiment, an index screen and digest screen in a program can be selected and set as structuring of the video information. The index screen and digest screen are "typical screens" used for typically or summarily comprehending the content of a picture in a program unit, scene group unit, or scene unit. In this embodiment, the index screen is defined as a still image having information such that it can typically display the title or content in a program unit, scene group unit or scene unit. The digest screen is defined as a still image or moving image having information such that it can summarily (for example, like an outline) show the content of a picture in program unit, scene group unit, or scene unit more specifically than the index screen.

[0029]

In the following, an example of setting the index screen in this embodiment will be explained with reference to Figures 4-7. Since the index screen is a still image, the index screen is preferably formed by using one frame image in consideration of the picture quality. However, since a field is the smallest unit used for handling a program, the following explanation is based on the fact that the index screen is set in a field image unit.

[0030]

Figure 4 shows an example of setting an index screen with respect to a scene unit. This figure illustrates three examples. In the setting example of a scene group or scene of a program shown in this figure, the same parts as those shown in Figure 1 are represented by the same respective symbols and will not be explained again. The first example is shown as index screen setting with respect to scene Aj (Figure 4(c)). In this case, scene Aj is formed by plural field images Aj1-Ajn (n is a variable indicating the final field number of the scene concerned) as shown in Figure 4(d). In this case, the first field image Aj1 is set as index screen INDX. In other words, out of the field images that form the scene, the first field image is selected as the index screen. The second example is shown as index screen setting with respect to scene Ia (Figure 4(c)). When said scene Ia is formed by plural field images Ia1-Ian as shown in Figure 4(d), out of said field images, any intermediate field image Iak selected based on a prescribed rule (k corresponds to the field number of the selected field image, $1 < k < n$) is set as index screen INDX. That is, out of the field images that form the scene, an intermediate field image is selected

as the index screen. The third example is shown as index screen setting with respect to scene La (Figure 4(c)). Said scene La is formed by plural field images La1-Lan as shown in Figure 4(d). In this case, the last field image Lan is selected as index screen INDX. In this example, out of the field images that form the scene, the last field image is selected as the index screen.

[0031]

Figure 5 shows an example of setting an index screen with respect to a scene group unit. The same parts as those shown in Figure 4 are represented by the same respective symbols and will not be explained again. The first example is shown as index screen setting with respect to scene group A. Scene group A shown in Figure 5(b) is formed by 14 scenes, that is, scenes Aa-Am as shown in Figure 5(c). If the first scene Aa in said scene group is formed by plural field images Aa1-Asn as shown in Figure 5(d), the first field image Aa1 in said field image group is selected as index screen INDX. In other words, in the first example, when setting the index screen with respect to a scene group, out of the scenes that form the scene group, the first scene is selected, and out of the field images that form the first scene, the first field image is selected as the index screen. As a result, out of the field images that form the scene group, the first field image is selected as the index screen.

[0032]

The second example is shown as index screen setting with respect to scene group I. Scene group I shown in Figure 5(b) is formed by 14 scenes, that is, scenes Ia-Im as shown in Figure 5(c). Out of these scenes, the 10th scene Ij is selected as the intermediate scene based on a prescribed rule. Scene Ij is formed by field images Ij1-Ijn as shown in Figure 5(d). In this case, the first field image Ij1 is selected as index screen INDX. That is, in the second example, out of the scenes that form the scene group, an intermediate scene is first selected based on a prescribed rule. Then, out of the field images that form said intermediate scene, the first field image is selected as the index screen.

[0033]

The third example is shown as index screen setting with respect to scene group L. The scene group L shown in Figure 5(b) is formed by 14 scenes, that is, scenes La-Lm as shown in Figure 5(c). Then, the last scene Lm out of said scenes is first selected. Said scene Lm is formed by field images Lm1-Lmn as shown in Figure 5(d), and the first field image Lm1 is selected as index screen INDX. Consequently, in the third example, the last scene is selected from the scenes that form the scene group. Then, the first field image out of the field images that form the last scene is selected as LNN [sic; as the index screen].

[0034]

Figure 6 shows an example of setting an index screen with respect to another scene group unit, which is different from the setting method shown in Figure 5. The same parts as those shown in Figures 4 and 5 are represented by the same respective symbols and will not be explained again. The first example is shown as index screen setting with respect to scene group A. In this case, the first scene Aa (shown in Figure 6(b)) is first selected from scene group A. Said first scene Aa is formed by plural field images Aa1-Aan as shown in Figure 6(d). In this case, an intermediate field image Aak (1<k<n) selected based on a prescribed rule from the group of the field images is set as index screen INDX. That is, in the first example, when setting the index screen with respect to a scene group, the first scene is selected out of the scenes that form the scene group, and an intermediate field image is selected and set as the index screen out of the group of field images that form the first scene.

[0035]

The second example is shown as index screen setting with respect to scene group I. In this case, first, scene Ijk [sic; Ij] is selected based a prescribed rule out of scenes Ia-Im that form scene group I shown in Figure 6(b). Said scene Ijk is formed by field images Ija-Ijn as shown in Figure 6(d). In this case, intermediate field image Ijk selected based on a prescribed rule out of said field images Ija-Ijn and is set as index screen INDX. That is, in the second example, an intermediate scene is first selected based on a prescribed rule out of the scenes that form the scene group. Then, an intermediate field image is selected out of the field images that form the intermediate scene as the index screen.

[0036]

The third example is shown as index screen setting with respect to scene group L (Figure 6(b)). In this case, first, the last scene Lm (shown in Figure 6(c)) is selected out of the scenes that form scene group L. Said scene Lm is formed by field images Lm1-Lmn as shown in Figure 6(d). In this case, an intermediate field image Lmk selected based on a prescribed rule is set as index screen INDX.

[0037]

Figure 7 shows an example of setting the index screen with respect to yet another scene group unit, which is different from the setting methods shown in Figures 5 and 6. The same parts as those in Figures 4-6 are represented by the same respective symbols and will not be explained again.

[0038]

The first example is shown as index screen setting with respect to scene group A. In this case, the first scene Aa (shown in Figure 7(b)) is first selected in scene group A. Said first scene Aa is formed by plural field images Aa1-Aan as shown in Figure 7(d). In this case, the last field image Aan is selected out of the field image groups and is set as index screen INDX. Consequently, in the first example, when setting the index screen with respect to scene group, the first scene is first selected. Then, the last field image is selected out of the field images that form the first scene and is set as the index screen.

[0039]

The second example is shown as index screen setting with respect to scene group I. In this case, scene Ijk [sic; Ij] is first selected based on a prescribed rule out of scenes Ia-Im that form scene group I shown in Figure 7(b). Said scene Ijk is formed by field images Ija-Ijn as shown in Figure 7(d). In this case, the last field image Ijn out of said field images Ija-Ijn is set as index screen INDX. That is, in the second example, an intermediate scene is first selected based a prescribed rule out of the scenes that form the scene group. Then, the last field image out of the field images that form the intermediate scene is selected as the index screen.

[0040]

The third example is shown as index screen setting with respect to scene group L (Figure 7(b)). In this case, the last scene Lm (shown in Figure 7(c)) is first selected out of the scenes that form scene group L. Said scene Lm is formed by field images Lm1-Lmn as shown in Figure 7(d). In this case, the last field image Lmk [sic; Lmn] selected based on a prescribed rule is set as index screen INDX.

[0041]

Examples of setting an index screen with respect to a scene unit or scene group unit have been explained above based on Figures 4-7. It is also possible to set an index screen with respect to a program unit as explained in Figures 4-7. Also, the rules of index screen setting with respect to a scene unit or scene group unit shown in Figures 4-7 are only examples. It is of course possible to select and set based on other rules.

[0042]

1-d. Digest image setting example

Examples of setting a digest image in this embodiment will be explained based on Figures 8-11. There are two kinds of digest images, that is, a still image and a moving image. In this case, however, since the minimum unit for handling a program is a field, the following explanation will be based on the fact that the digest image is also set in a field image unit.

[0043]

Figure 8 shows a case in which one digest image formed by a still image is selected from one scene. The same parts as those in Figures 4-7 are represented by the same respective symbols and will not be explained again. In this case, three examples will be shown as digest image selecting and setting examples with respect to scene Ij shown in Figure 8(c).

[0044]

The first example is shown in Figure 8(d). In this case, out of the field images that form scene Ij, the first field image is selected as digest image DGs formed by a still image. In the second example, out of the field images that form scene Ij, an intermediate field image is selected based on a prescribed rule as digest image DGs formed by a still image as shown in Figure 8(e). In the third example, out of the field images that form scene Ij, the last field image is selected as digest image DGs formed by a still image as shown in Figure 8(f).

[0045]

The digest image selection rule shown in said Figure 8 can be applied to a case in which it is sufficient to permit comprehension the content of the scene by only using the information of one still image in that scene. More specifically, if the scene pertains to a drawing or sculpture that is shown by a still image, it is possible to comprehend the content of that scene sufficiently by using only one field image extracted from that scene. Therefore, a digest image can be selected as shown in Figure 8.

[0046]

Figure 9 shows a case in which plural digest images formed by still images are selected from one scene as a digest image selecting and setting example with respect to a scene unit. The same parts as those shown in Figure 8 are represented by the same respective symbols and will not be explained again. In this case, four examples are shown as digest image selecting and setting examples by using still images with respect to scene Ij shown in Figure 9(c).

[0047]

The first example is shown in Figure 9(d). In this case, out of the field images that form scene Ij, the first field image is selected as digest image DGs formed by a still image. Then, a field image selected every prescribed interval based on a prescribed rule is set as digest images DGs, DGs, DGs, ... formed by still images. The second example is shown in Figure 9(e). In this case, out of the field images that form scene Ij, the first field image is selected as first digest image DGs formed by a still image. Then, field images having appropriate information that can be used as digest images for individual content items of the scene are selected and set as appropriate digest images DGs, DGs, DGs, ... Based on this digest image setting rule, the number of digest images DGs that are actually set with respect to one scene can vary appropriately corresponding to the content of the scene. There is no special limitation on that number. The third example shown in Figure 9(f) is based on said first example. In this case, however, instead of selecting the first field image as the first digest image DGs for the scene, field images selected every prescribed interval based on a prescribed rule starting from a certain field image after the first field image are set as digest images DGs, DGs, DGs, ... The fourth example is shown in Figure 9(g). The fourth example is based on the second example. In this case, however, the first field image is not selected as a digest image DGs formed by a still image. Instead, appropriate field images are simply selected as appropriate digest images DGs, DGs, DGs, ... corresponding to the content of the scene.

[0048]

In consideration of the role played by a digest image, it is preferable to select and set digest images as described in said second example (Figure 9(e)) or fourth example (Figure 9(g)) so that the viewer can easily comprehend the content of the scene. However, in a case in which normal programs are received on the side of the receiving equipment, followed by structuring the video information of the programs on the side of the receiving equipment, if the setting method disclosed in the first example (Figure 9(d)) or fourth [sic; third] example (Figure 9(f)) is used, the digest images can be easily set automatically.

[0049]

Figure 10 shows a case in which one digest image formed by a moving image is selected from one scene as a digest image selecting and setting example with respect to a scene unit. The same parts as those shown in Figures 8 and 9 are represented by the same respective symbols and will not be explained again. In this case, three examples are shown as digest image selecting and setting examples by using moving images with respect to scene Ij shown in Figure 9(c). In the example shown in Figure 10(d), the moving image information (that is, plural consecutive field

images) of the initial part of scene Ij is selected and set as digest image DGm formed by a moving image. In the example shown in Figure 10(e), the moving image information of an intermediate part selected based on a prescribed rule in scene Ij is selected and set as digest image DGm. In the example shown in Figure 10(f), the moving image information of the last part in scene Ij is selected and set as digest image DGm. In the digest image setting method shown in this figure, the length (number of field images) per digest image can be varied appropriately corresponding to the content of the scene. However, to simplify the method, it is possible to preset and fix the number of field images corresponding to an appropriate length for the digest image.

[0050]

Figure 11 shows a case in which digest images formed by still images and digest images formed by moving images selected from one scene are combined as a digest image selecting and setting example with respect to a scene unit. The same parts as those show in Figures 8-10 are represented by the same respective symbols and will not be explained again. A first example is shown in Figure 11(d). In this case, out of the field images that form scene Ij, the first consecutive field images are selected first as digest image DGm formed by a moving image. Then, appropriate digest images DGs, DGs, DGs ... formed by still images are selected corresponding to the content of the scene. A second example is shown in Figure 11(e). In this case, the first consecutive field images are selected first as digest image DGm formed by a moving image. Then, appropriate digest image DGm formed by a moving image is selected. The third example is shown in Figure 11(f). In this case, the first consecutive field images are selected first as digest image DGm formed by a moving image. Then, digest image DGs formed by a still image and digest image DGm formed by a moving image are selected and combined appropriately. When digest image DGs formed by a still image and digest image DGm formed by a moving image are combined to form the digest images as described above, digest images having information that can facilitate comprehending of the content of the scene can be obtained even if the variation in the images in one scene is relatively significant.

[0051]

Management information indicating the results of setting an index screen and digest image for each program is required in order to manage the index screen and digest image set as explained above as structured video information. The management information used for the index screen and digest image can adopt the following form. First, a plug region indicating whether index screens and digest images are set respectively without regard to a program unit, scene group unit, or scene unit for the program concerned is adopted in a prescribed region at the

head of the video information in a program unit. In this way, whether index screens and digest images are set with respect to the program concerned can be determined by monitoring a prescribed region in the head of the video information of the program during video information management. Consequently, retrieval in a field image unit is not necessary.

[0052]

Then, type flags indicating the presence/absence of index screens and digest images set with respect to a program unit, scene group unit, and scene unit are required. These flags can be added in the ID data area shown in Figure 2. First, a flag indicating the presence/absence of index screens and digest images set with respect to a program unit is added in program ID area AR2 shown in Figure 2(b). Also, a flag indicating the presence/absence of index screens and digest images set with respect to a scene group unit is added in program ID area AR2 shown in Figure 2(c). A flag indicating the presence/absence of index screens and digest images set with respect to a scene group unit [sic; scene unit] can also be added in program ID area AR2 shown in Figure 2(c). In this way, it is possible to determine whether index screens and digest images are set for respective hierarchies of program, scene group, and scene.

[0053]

Then, a flag indicating whether an index screen or digest image is set for each field image is inserted at a prescribed position in the ID data area shown in Figure 2(a). In this way, it is possible to determine the field image set as an index screen or digest image based on the ID area data for each field image. Also, for example, when plural index screens or digest images are set for one structuring unit, information of the sequential number (number) of an index screen or digest image in that structuring unit is stored. In the case of a digest image formed by a moving image, information indicating the field number in the digest image is stored.

[0054]

However, when all of said information is stored in the ID data area, since an ID data area is added for each field image, the amount of data to be handled will increase significantly. Therefore, it is preferable to separately prepare a data table to store the essential information regarding the field image set as said index screen and digest image to realize correspondence with the actual field image data.

[0055]

Also, there is no special limitation on the form of index display by the index screen selected and set as explained above or on the form of digest display by the digest image. For

example, in the case of index display or digest display using a still image, it is possible to display a certain specific still image continuously or display frame by frame like a slide show if plural images are selected. In the case of handling a moving image as digest display, the display is usually performed at normal playback speed. It is also possible to display the images in the fast forward mode.

[0056]

2. Broadcasting system example as this embodiment

A broadcasting system as in this embodiment can adopt any of the first through fourth forms shown in Figures 12-15. Figure 12 conceptually shows a configuration example of the first form of the broadcasting system in this embodiment. Transmitting equipment 1 shown in this figure has video source 2, transmitted picture encoder 3, transmission buffer 4, and modulator 5 for transmission. Video source 2 is used to form a program in said transmitting equipment 1. The information of audio signals accompanying the video signals is also included in said video source 2.

[0057]

Transmitted picture encoder 3 receives the input of video source 2 as a program, for example, and structures the video information of that program. Said structuring treatment hierarchizes the video information of the program depending on the scene group and scene and sets an index screen and digest image as previously explained. Also, in said transmitted picture encoder 3, a prescribed digital signal processing is performed on video source 2 to be structured, and a prescribed encoding processing is carried out so that the data format becomes suitable for storage in transmission buffer 4 and suitable for transmission by modulator 5. If necessary, compression or other processing in the stage of encoding processing is also possible.

[0058]

Transmission buffer 4 stores the video information obtained by transmitted picture encoder 3 as data. Said transmission buffer 4 can be comprised of a hard disk or optical disc, photomagnetic disc, or other random access disc-shaped recording medium and the corresponding driver. It can also have a high-capacity semiconductor memory. That is, high-capacity media that are capable of random access and can easily realize high-speed access are used. There is no special limitation on the type of media. The video information stored in transmission buffer 4 is supplied to modulator 5 for appropriate transmission in accordance with a broadcasting program.

[0059]

Said modulator 5 for transmission modulates corresponding to a prescribed broadcasting system (for example, broadcasting system using terrestrial waves, communication satellites, CATV or the like) to which said transmitting equipment 1 corresponds so that the video information transmitted from transmission buffer 4 can be broadcast as broadcasting signals. The output of modulator 5 for transmission is transmitted and output as broadcasting signals via a prescribed broadcasting/communication medium M.

[0060]

Receiving equipment 100 has tuner/decoding circuit 101, storage device 102, video editing part 103, control part 104, display 105, and remote controller reception part 106 ("remote controller" will be referred to as remote control hereinafter).

[0061]

Tuner/decoding circuit 101 receives/selects the signals transmitted from transmitting equipment 1 and demodulates corresponding to modulator 5 for transmission with respect to the received signals. The video information output from transmitting equipment 1 as described above is supplied to storage device 102 wherein it is stored as data. For the data stored in storage device 102, if the video information as the received signals is structured on the side of the transmitting equipment, the structured video information is stored as data.

[0062]

In this case, there is no special limitation on storage device 102. For example, it is possible to use a storage device comprised of a random access disc-shaped recording medium and a corresponding driver like said transmission buffer 4. It is also possible to use a high-capacity semiconductor memory. In this case, however, since storage device 102 needs to store a relatively large amount of image data, it is preferable to use high-capacity random access media that can easily realize high-speed access.

[0063]

Video editing part 103 reads out the essential information from the video information stored in storage device 102 in the structuring unit with reference to various kinds of ID stored in the ID data area (see Figure 2) and edits said video information to be suitable for the required content. In this specification, video information of a certain kind formed as a result of the editing is also handled as a "program" and is referred to as an "edited program" to be distinguished from normal programs. Said video editing part 103 is also equipped with a circuit that performs

required digital signal processing to the video information and the accompanying audio signals, and a circuit that decodes in order to convert the video data in a prescribed format into video signals that can be displayed.

[0064]

Display 105 displays a picture based on the video signals supplied from video editing part 103. In this case, there is no special limitation on the display device that constitutes display 105, which can be a CRT (cathode ray tube) or liquid crystal display panel.

[0065]

Control part 104 is used to control the operation of various functional circuits inside said receiving equipment 100. In this figure, the signal lines between the functional circuits inside control part 104 and the rest of receiving equipment 100 are omitted.

[0066]

Remote control reception part 106 receives command signals transmitted from a remote controller not shown in the figure. Command signals used for indicating the content of the "edited program" formed by the video editing part in this embodiment are also included as said command signals. The received command signals are transmitted to control part 104. Appropriate control processing is carried out based on the transmitted command signals in control part 104.

[0067]

In this broadcasting system, on the transmission side, for example, a broadcasting program can be transmitted and output as "structured video information" by adding an ID or table data corresponding to the structured hierarchies or contents.

[0068]

Then, on the side of the viewer (reception side), a desired scene or scene group can freely be selected and edited from said "structured video information" received and stored such that it can be viewed as an edited program. For example, if the original broadcasting program is sports news and the viewer only wants to extract and view information regarding baseball from the sports news, by collecting and editing the scenes or scene groups regarding baseball, it is possible to form an edited program that only includes baseball information, and the viewer can view said edited program on display 105. It is also possible to form an edited program by

selecting an image set as the index screen or digest image in the program. In this way, it is possible to easily realize a viewing form for receiving a summary of that program.

[0069]

The operation for forming said editing program is as follows. For example, the viewer enters a command signal requesting the content (information) that the viewer wants to view from the video information of a certain program stored in storage device 102 by operating a remote control. Said command signal is transmitted via remote control reception part 106 to control part 104. Upon receiving said command signal, control part 104 reads out the video information from storage device 102 in the required structuring unit corresponding to the content requested by the viewer in said program and sends the video information to video editing part 103. At the time said video information is read out, control part 104 identifies the essential information with reference to the data in the ID data area explained based on Figure 2 or the table data indicating said index screen or digest image setting state. The video information in the required structuring unit supplied from storage device 102 to video editing part 103 is edited under the control of control part 13 to form video information of the "edited program" unit. At that time, a decoding operation (if necessary, including data extension processing) for converting the video information of the "edited program" from the format suitable for recording in storage device 102 to video signals that can be displayed on display 105 and the accompanying required digital AV signal processing are carried out in video editing part 103.

[0070]

Figure 13 conceptually shows a configuration example of the second form of the broadcasting system in this embodiment. The same parts as those shown in Figure 12 are represented by the same respective symbols and will not be explained again. In this case, video information of the normal program unit that is not structured is supplied via a prescribed broadcasting/communication medium M and a video source S supplied from a conventional AV machine, such as a VTR, to receiving equipment 200. In this case, multi-channel broadcasting signals are transmitted from the transmission side. Video source S is supplied directly to display 105 so the viewer can watch unedited programs. It is also supplied to video information encoder 202. On the other hand, the broadcasting signals supplied via broadcasting/communication medium M are received/selected by multi-channel simultaneous reception tuner 201. The video information in a program unit received/selected by multi-channel simultaneous reception tuner 201 is supplied to video information encoder 202.

[0071]

Video information encoder 202 can be realized by adopting almost the same configuration as transmitted picture encoder 3 in transmitting equipment 1 shown in Figure 12. The video information in a program unit supplied to video information encoder 202 can be stored as structured video information in storage device 102 after undergoing the structuring processing that has been previously explained (add ID data or table data along with structuring), the required digital AV signal processing, and encoding based on a format suitable for recording in storage device 102.

[0072]

In the broadcasting system shown in this figure, the structuring processing with respect to the video information of the program and the editing processing for forming an edited program as preferred by the viewer are both carried out on the side of the receiving equipment. First, as the structuring processing performed on the side of the receiving equipment, in a state in which the video information of the program is being recorded in storage device 102 or in a state in which the video information of the program has been recorded in storage device 102, the structuring unit (scene group, scene, index screen, digest image) can be set as the viewer provides marks by operating the remote control while watching a program on the display.

[0073]

The program is structured automatically by following a preset rule during recording of the video information of the program in storage device 102. For example, to set a scene group or scene automatically, conventional image movement detection technology is adopted, and the partition of a scene group or scene is set when an image movement (variation) higher than a set threshold value is obtained under prescribed conditions. Alternatively, it is possible to monitor the continuity of the sound accompanying the picture and set the partition of a scene group or scene based on that.

[0074]

The index screen and digest image can also be set automatically by adopting a selection setting method that follows a prescribed rule as explained in Figures 4-11. Also, in the case of setting the index screen and digest image appropriately in order to express the content of each structuring unit as much as possible, it is possible to monitor the continuity of the picture movement or sound and select a field image unit or main image unit.

[0075]

Figure 14 conceptually shows a configuration example of the third form of the broadcasting system in this embodiment. The same parts as those shown in Figures 12 and 13 are represented by the same respective symbols and will not be explained again. The transmitted picture encoder 13 in transmitting equipment 10 shown in this figure adds a function for editing the structured video information to the configuration of transmitted picture encoder 3 shown in Figure 12. Said transmitted picture encoder 13 can process video source 2 into structured video information and form an edited program having different contents based on the structured video information. Consequently, the original program from which said edited program is formed and the video information of various formed edited programs are supplied from transmitted picture encoder 13 to transmission buffer 4. The contents of the edited programs formed by the receiving equipment in this broadcasting system and the number of programs are based on judgment on the transmission side (program producer) in consideration of the need on the viewer side.

[0076]

Said transmitting equipment 10 also has a multi-channeling part 11 between transmission buffer 4 and modulator 5 for transmission. In this way, from transmitting equipment 10, the video information of the programs (including edited programs) stored in transmission buffer 4 is multi-channeled and output from modulator 5 for transmission. In other words, a certain original program and plural edited programs derived from the original program can be transmitted at the same time by means of multi-channeling.

[0077]

Receiving equipment 300 has tuner/decoding circuit 101, control part 104, display 105, and remote control reception part 106. In this case, when the viewer operates the remote control, a command signal (user request information) indicating the content that the viewer wants to watch with respect to the program being broadcast is transmitted. Control part 104 analyzes said user request information received via remote control reception part 106 and controls tuner/decoding circuit 101 to select the channel corresponding to the content indicated by said user request information. In this way, the program or edited program of the content desired by the viewer is shown on the display so that the viewer can watch the program. To realize said viewing system, it is necessary to transmit an information signal, such as an ID, indicating the content of each program (channel) as the form corresponding to the user request information on the side of the receiving equipment during program transmission. Such information is added, for example, in the transmitted picture encoder 13 of transmitting equipment 10.

[0078]

Figure 15 conceptually shows a configuration example of the fourth example of the broadcasting system in this embodiment. The same parts as those shown in Figures 12-14 are represented by the same respective symbols and will not be explained again. Transmitting equipment 20 shown in this figure adds video editing part 21 and control part 22 to the configuration of transmitting equipment 1 shown in Figure 12. In this case, video editing part 21 is provided between transmission buffer 4 and modulator 5 for transmission. Said video editing part 21 can adopt the same configuration as video editing part 103 provided on the side of receiving equipment 100 in Figure 12. In video editing part 21, however, the decoding operation for converting the signals into a format suitable for recording in storage device 102 can be omitted. Control part 22 controls the operation of each functional circuit in transmitting equipment 20. In this case, it controls video editing part 21 based on the content of the user request information transmitted from the side of the receiving equipment to form a desired edited program.

[0079]

Receiving equipment 400 shown in the figure has tuner/decoding circuit 101, display 105, control part 104, remote control reception part 106, and transmission part 401. In this broadcasting system, on the side of receiving equipment 400, when the viewer operates the remote control, a command signal for requesting the program with the desired content is sent as "user request information" to receiving equipment 400. The control part 104 in receiving equipment 400 outputs said user request information input via remote control reception part 106 to transmission part 401. Transmission part 401 can transmit the signal in a format corresponding to a prescribed transmission means. In this case, it transmits the input user request information to the side of transmitting equipment 20. There is no special limitation on the transmission form adopted to transmit the user request information. For example, it is possible to use a communication system using a telephone line. In this case, for example, transmission part 401 is equipped with a modem or the like. It is also possible to transmit the information using a wired device. In some cases, said information can be transmitted wirelessly.

[0080]

As described above, the user request information transmitted from the side of receiving equipment 400 is received on the side of transmitting equipment 20 and is supplied to control part 22 inside the transmitting equipment. Control part 22 analyzes the content of the received user request information and determines the content of the edited program to be formed. Then, based on said determination result, control part 22 reads out the video information having the

content needed to form the edited program in the structuring unit from the structured video information stored in transmission buffer 4 and sends the video information to video editing part 21. Then, control part 22 performs control such that the video information is edited in the structuring unit sent to video editing part 21. In this way, the desired edited program is formed in video editing part 21. If a normal program is requested instead of an edited program based on the user request information, the video information of that normal program is read out from transmission buffer 4 and is handled by video editing part 21. The video information of the edited program (or normal program) formed in video editing part 21 is supplied to modulator 5 for transmission, which modulates the carrier so that the video information of the program can be transmitted by a prescribed channel assigned to receiving equipment 400.

[0081]

On the side of receiving equipment 400, the picture of the program transmitted from the side of transmitting equipment 20 as described above is received. The tuner/decoding circuit 1 selects said specified channel, performs a prescribed decoding operation (in this case, if necessary, including data extension processing) on the selected broadcasting signals, and supplies the decoded signals to display 105. In this way, a program with content suitable for the user request information entered by the viewer is shown on display 105. The broadcasting system of the fourth example adopts a so-called on-demand form that forms programs with contents suitable for the request of the viewer based on the structured video information stored on the transmission side and supplies the programs to the viewer side.

[0082]

The broadcasting systems explained based on Figures 12-15 can provide not only normal programs but also edited programs formed based on structured video information to meet the requested viewing form of each different viewer. Also, since the edited programs are formed based on video information structured for normal programs, there is no need to provide a special video source. Therefore, the number of video sources to provide on the production side (broadcasting side) will not increase significantly. In addition, when forming normal programs, a fairly large amount of video information that is actually picked up may be abandoned in the editing step. In this embodiment, however, the video information to discard is also structured, managed, and stored as described above. Therefore, it is also possible to form edited programs by using said video sources. In the case of a broadcasting system that forms edited programs on the broadcasting side, it is possible to take advantage of all of the video sources as described above. In the broadcasting system disclosed in this embodiment, it is also possible to reduce the

program production cost. There are various kinds of broadcasting systems using structured video information in addition to the broadcasting system examples shown in Figures 12-15.

[0083]

3. Method of recording video information to storage device

In the following, examples of methods for recording video information (actual video/audio data) in storage device 102 shown in Figures 12-13 will be explained based on Figures 16-24 [sic; 16-23]. Figure 16 conceptually shows a first recording method example and the corresponding reading processing. As shown in Figure 16(a), one program is formed by the field units (or frame units) of the first field through last field. Figure 16(b) conceptually shows the recording state with respect to the recording medium in storage device 102. The recording region of the recording medium is composed of sector units having a prescribed data length as shown in the figure. A sector header indicates partitioning of the sector at the beginning of each sector. In this case, the data of a field unit are recorded continuously as bit stream data irrespective of the partitioning of the sectors as shown in Figure 16(b). However, in the sector where the final field is present, if the region of that sector has a margin, that region will be filled by stuffing bits SB in a prescribed form as shown in the figure. In this way, division of the program unit can be shown. In this case, although it is not shown in the figure, the data of a field unit are recorded to form a list file indicating the physical and logical addresses regarding the program, scene group, scene, and index screen, digest screen. Since the program data are recorded as compactly as possible in this recording method, the capacity needed for recording one program is small. Then, the data recorded in this way are read out. In this case, however, there is no relationship between partitioning of the field units and partitioning of the sectors. Therefore, for example, if two fields are extracted and read out for the purpose of video editing, as shown in Figure 16(c), after all sectors including the second field are read out, preceding and succeeding unnecessary field image data are erased in the decoding step. In this way, the data of the second field shown in Figure 16(d) are extracted.

[0084]

Figure 17 conceptually shows a second recording method example and the corresponding readout operation. The same parts as those shown in Figure 16 are represented by the same respective symbols and will not be explained again. As shown in Figure 17(a), one program is formed by the field units (or frame units) of the first field through last field. In this case, as shown in Figure 17(b), the data of plural field units are recorded appropriately so that they are not in the same sector. In the sector where the end of the field image data is present, if the region of that sector has a margin after the end of the field image data, that region is filled up by

stuffing bits SB in a prescribed form as shown in the figure. When the data are recorded in this way, as shown in Figure 17(c), the sectors including the second field are read out and stuffing bits SB are erased. In this way, the data of the second field shown in Figure 17(d) are extracted.

[0085]

In this case, since the beginning position of the field image data is always at the head of a sector, the field unit can be accessed quickly. Also, although a detailed explanation is omitted, since stuffing bits SB can be erased in storage device 102, data that are unnecessary for video editing do not have to be transmitted. Therefore, the data transmission efficiency can also be increased.

[0086]

Figure 18 conceptually shows a third recording method example and the corresponding readout operation. The same parts as those shown in Figures 16 and 17 are represented by the same respective symbols and will not be explained again. In this case, the recording method is based on the scene unit. As shown in Figure 18(a), one program is formed by the scene units (or frame units) of the first scene through last scene. In this case, as shown in Figure 18(b), the data of plural scene units are recorded appropriately so that they are not in the same sector. In a sector where the end of the data of a scene is present, if the region of that sector has a margin after the end of the scene image data, that region is filled up by stuffing bits SB in a prescribed form as shown in the figure. Then, for example, if the second scene is read out as a data reading operation in a scene unit, as shown in Figure 18(c), the sectors including the second scene are read out, and the stuffing bits SB are erased. In this way, the data of the second scene shown in Figure 18(d) are extracted.

[0087]

In this case, since the beginning position of the data of a scene is always the head of a sector, the scene unit can be accessed quickly as in the case shown in Figure 17. Also, since one scene is formed by tens to thousands of frames, in this case, the frequency of filling stuffing bits SB in a sector is very low. Therefore, the recording capacity of the recording medium can be used effectively. Also, in this case, stuffing bits SB in storage device 102 can be erased when the data are read out with respect to the recording medium.

[0088]

Figure 19 conceptually shows a fourth recording method example and the corresponding readout operation. The fourth recording method example regards the case of recording field

images recorded as index screens or digest screens formed by still images. First, the field images that are not set as an index screen or digest screen formed by a still image are recorded in the recording medium by using the recording method explained based on Figure 16, and the data are then read out. Figure 19(a) shows the (J-1)th field, the Jth field, and the (J+1)th field in a certain program. In this case, for example, when the Jth field out of said (J-1)th through (J+1)th fields is set as an index screen, as shown in Figure 19(b), stuffing bits SB are filled in the extra region of the sector where the end of the data of the previous (J-1)th field is present. Then, recording of the data of the Jth field is started from the head of the sector. Stuffing bits SB are filled in the extra region of that sector where the end of the data is present. Then, recording of the data of the (J+1)th field is started from the head of the next sector after the final sector where the Jth field is recorded. After that, recording is performed using the method shown in Figure 16(b) until the field image set as the index screen or the digest screen formed by a still image is used. Recording of the field image set as the digest screen formed by a still image is also carried out as explained above. In the case of recording a digest screen formed by a moving image, the recording method for the scene explained based on Figure 18 is applied to the consecutive field images that form the digest screen.

[0089]

In this recording method, if the program data are viewed in a field unit, they can be recorded independently corresponding to the sector unit by only dividing the field images set as index screen and digest screen by stuffing bits SB. Therefore, the field images set as index screen and digest screen can be accessed and read out quickly. Also, since the field images other than those set as index screen and digest screen are recorded compactly across sectors according to the recording method explained based on Figure 16, the number of sectors filled by stuffing bits SB is limited so it is possible to effectively use the recording capacity of the recording medium.

[0090]

In the following, physical recording method examples for video information will be explained with reference to Figures 20 and 21. In this case, the recording medium in the storage device is a random access disc-shaped recording medium. Recording medium RM is shown in Figure 20. Data are recorded on this recording medium RM from its outer periphery towards the inner periphery. In this case, the video information data of a certain program are recorded on recording medium RM. The recording region DP where the data of that program are recorded is shown by thick lines on the recording medium RM shown in the figure. Then, digest screens DG1, DG2, DG3, DG4 (in this case, the digest screens are formed by moving images) are set for this program. Said digest screens DG1, DG2, DG3, DG4 are recorded at the positions indicated

by broken lines in the recording region DP as shown in the figure. In this case, to facilitate the explanation, digest screens DG1, DG2, DG3, DG4 formed by moving images are selected at an equal interval of every M frames and are all formed by the data of N frames. The relationship between M frames and N frames is M >> N. Also, said digest screens DG1, DG2, DG3, DG4 are obtained in the order of DG1 → DG2 → DG3 → DG4 according to the normal playback time axis of the program recorded in recording region DP.

[0091]

Figure 21 is a diagram explaining the operation of reading digest screens DG1, DG2, DG3, DG4 from recording medium RM shown in Figure 20 along the time axis in order to play back the digest screens formed by the video information of digest screens DG1, DG2, DG3, DG4. In this case, in order to facilitate the explanation, for the data recorded on recording medium RM, the information amount for each frame is fixed (1 frame = A bits), and the frame frequency is F frames/sec. To output video signals decoded in synchronization with said frame frequency under this condition, it is necessary to read A bits equivalent to 1 frame every 1/F sec as the output of the data read out of storage device 102.

[0092]

Also, in this case, the data reading operation sequentially accesses the head of the digest screen. Therefore, it is necessary to complete the operation of reading the data of N frames (A x N bits) equivalent to 1 digest screen and the operation of accessing the head of the data of the next digest screen during N/F sec equivalent to the time for displaying N frames.

[0093]

Figure 22 shows the relationship between the time of the data reading operation with respect to the storage device and the data reading rate. As can be seen from this figure, there is an access period for accessing the head of the next digest screen after each data reading period of digest screens DG1, DG2, DG3. If the time equivalent to the reading period required for reading one digest screen is Tr and the time required for accessing the head of the data of the next digest screen is Ts, the total time of Tr sec + Ts sec should be contained in the range of N/F sec.

[0094]

If the rate of reading data from the storage device is B bits/sec (B>A), said time Tr needed for reading the data of N frames (A x N bits) equivalent to one digest screen is expressed as follows.

$$Tr = (A \times N)/B$$

Then, if the time for completing the operation of reading the data of said N frames and the operation of accessing the head of the data of the next digest screen after completion of said operation is T_{total}, time T_{total} is expressed as follows.

$$T_{total} = Tr + Ts$$

As described above, said time T_{total} should be contained in the range of N/F sec.
Therefore, it is necessary to satisfy the following condition

$$N/F \geq T_{total} (=Tr + Ts)$$

If the time Ts needed for access is longer than N/F sec, there will be no time to read the data of the digest screen. Therefore, it is necessary to satisfy the following condition of
N/F > Ts. If this condition is satisfied, the following relationship becomes valid.
(N/F) – Ts ≥ Tr (=(A x N)/B). If
(N/F) – Ts = Tr (=(A x N)/B), the rate B of reading data from the storage device becomes the following
B = (A x N)/((N/F) – Ts). If this equation is rearranged, one will have the following
B = (A x F)/ (1-Ts x F/N)
As can be seen from this equation, if the time needed for access becomes longer with respect to N/F sec, the rate B of reading data from the storage device will increase rapidly. In particular, if N (number of frames that form a digest screen) is small, since N/F sec becomes short, it is necessary to shorten time Ts and Tr as much as possible. Therefore, in the case of recording the structured video information as shown in Figure 20, it is preferred to use a storage device 102 having an access rate as high as possible and a high data reading rate (data transmission rate).

[0095]

Figure 22 shows another physical recording method example for video information different from that shown in Figure 20. This recording method example can lower the required access speed and data transmission rate of the storage device in the recording method shown in Figure 20. The same parts as those show in Figure 21 are represented by the same respective symbols and will not be explained again. In this case, digest screens DG1, DG2, DG3, DG4 explained based on Figure 20 are set for a program. In this recording method example, the data of set digest screens DG1, DG2, DG3, DG4 are copied to form a digest data file region DF on the inner side of recording region DP where the data of one program are recorded. In this case, the data of digest screens DG1, DG2, DG3, and DG4 are recorded continuously. In this case, the amount of data recorded for one program is increased at least by as much as digest data file region DF compared with the recording method explained based on Figure 20.

[0096]

In the case of reading the data of digest screens DG1, DG2, DG3, DG4 in order to play back the digest screens from the recording medium RM whereon the data are recorded, it is possible to access said digest data file region DF to read the data continuously from the beginning position to the ending position. There is no need to re-access the data for every partitioning of the digest screen data. Figure 23 shows the relationship between the time and the data reading rate in this reading operation. As can be seen from this figure, the data of digest screens DG1, DG1, DG3, DG4 are read continuously, and there is no intermediate access period. As can be seen from Figure 23, there is no problem even if up to N/F sec is required to read the data of one digest screen. In the meantime, it is also acceptable if the rate of reading data from storage device 102 is A/F bits sec. Consequently, it also is acceptable if the data reading rate (transmission rate) and access speed required for the storage device are lower than those in the case of adopting the recording method explained based on Figure 20.

[0097]

The recording methods that have been explained based on Figures 16-23 can also be applied to the transmission buffer on the side of the transmitting equipment. The present invention is not limited to the configurations that have been previously explained. The configurations of the transmission and reception system, the receiving equipment, and the transmitting equipment can be varied appropriately corresponding to the actual use conditions.

[0098]

Effect of the invention

As explained above, the video information in a program unit is processed into "structured video information" manageable in a structuring unit on the transmission side or the reception side, and edited programs with desired content are formed based on the structured video information. In this way, it is possible to provide a picture with content that is suitable for the requested viewing form of each different viewer. Also, since it is possible to use the video sources needed to produce the original programs to form said edited programs, the broadcasting system of the present invention will not increase the program production cost.

Brief description of the figures

Figure 1 is a diagram explaining structuring of a program as an embodiment of the present invention.

Figure 2 is a diagram explaining a structure example of the ID data area added to the structured video information.

Figure 3 is a diagram explaining an example of superimposing an ID data signal onto a video signal.

Figure 4 is a diagram explaining an index screen setting example with respect to a scene group.

Figure 5 is a diagram explaining an index screen setting example with respect to a scene group.

Figure 6 is a diagram explaining an index screen setting example with respect to a scene group.

Figure 7 is a diagram explaining an index screen setting example with respect to a scene group.

Figure 8 is a diagram explaining an index screen setting example with respect to a scene.

Figure 9 is a diagram explaining an index screen setting example with respect to a scene.

Figure 10 is a diagram explaining an index screen setting example with respect to a scene.

Figure 11 is a diagram explaining an index screen setting example with respect to a scene.

Figure 12 is a diagram explaining an example of a broadcasting system as this embodiment.

Figure 13 is a diagram explaining an example of a broadcasting system as this embodiment.

Figure 14 is a diagram explaining an example of a broadcasting system as this embodiment.

Figure 15 is a diagram explaining an example of a broadcasting system as this embodiment.

Figure 16 is a diagram explaining an example of the recording method used when recording video information data on a recording medium in this embodiment.

Figure 17 is an explanatory diagram conceptually illustrating a recording method used when recording video information data on a recording medium and a data reading operation example in this embodiment.

Figure 18 is an explanatory diagram conceptually illustrating a recording method used when recording video information data on a recording medium and a data reading operation example in this embodiment.

Figure 19 is an explanatory diagram conceptually illustrating a recording method used when recording video information data on a recording medium and a data reading operation example in this embodiment.

Figure 20 is an explanation diagram illustrating a physical recording method example when recording video information data on a recording medium in this embodiment.

Figure 21 is a diagram explaining the data reading operation corresponding to the recording method example shown in Figure 20.

Figure 22 is an explanation diagram illustrating a physical recording method example when recording video information data on a recording medium in this embodiment.

Figure 23 is a diagram explaining the data reading operation corresponding to the recording method example shown in Figure 22.

Explanation of the reference symbols

1, 10, 20	Transmitting equipment
2	Video source
3, 13	Transmitted picture encoder
4	Transmission buffer
5	Modulator for transmission
11	Multi-channeling part
22	Control part
100, 200, 300, 400	Receiving equipment
101	Tuner/decoding circuit
102	Storage device
103	Video editing part
104	Control part
105	Display
106	Remote control reception part
201	Multi-channel simultaneous reception tuner
202	Video information encoder
203	Video editing part
401	Transmission part
M	Broadcasting/communication media
AR1	Time stamp area
AR2	Program ID area
AR3	Scene group ID area
AR4	Scene ID
AR5	Intra-scene field number area
AR6	Description area
INDX	Index screen

DGs, DGm Digest screen,
SB Stuffing bit

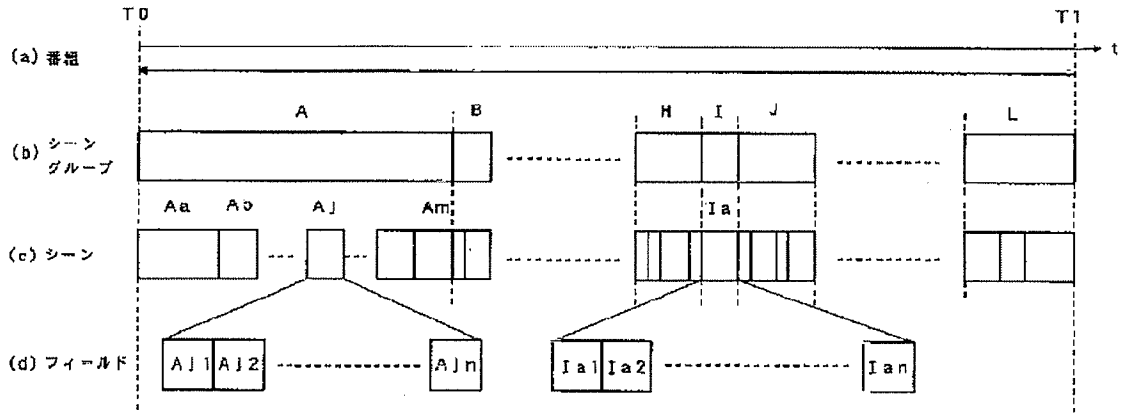


Figure 1

Key: (a) Program
(b) Scene group
(c) Scene
(d) Field

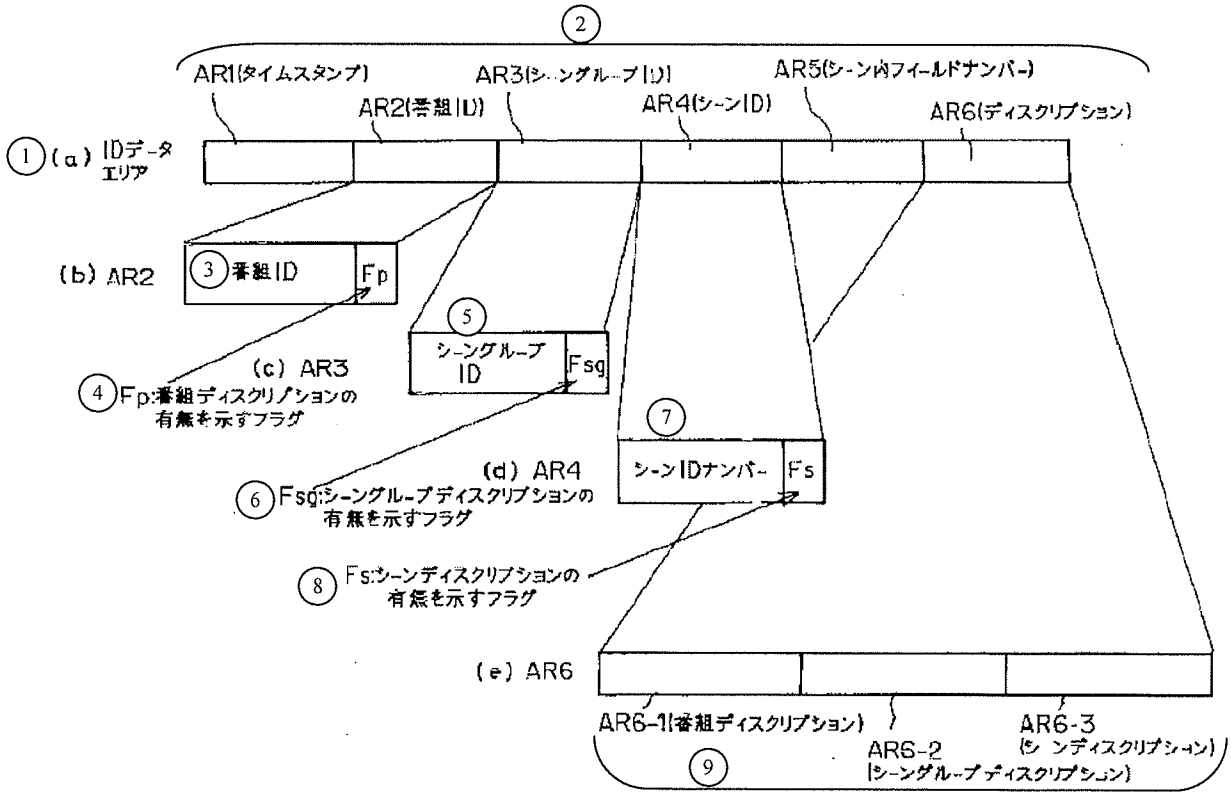


Figure 2

Key: 1 ID data area
2 AR1 (time stamp)
AR2 (program ID)
AR3 (scene group ID)
AR4 (scene ID)
AR5 (intra-scene field number)
AR6 (description)
3 Program ID
4 Fp: Flag indicating presence/absence of program description
5 Scene group ID
6 Fsg: Flag indicating presence/absence of scene group description
7 Scene ID number
8 Fs: Flag indicting presence/absence of scene description
9 AR6-1 (program description)
AR6-2 (scene group description)
AR6-3 (scene description)

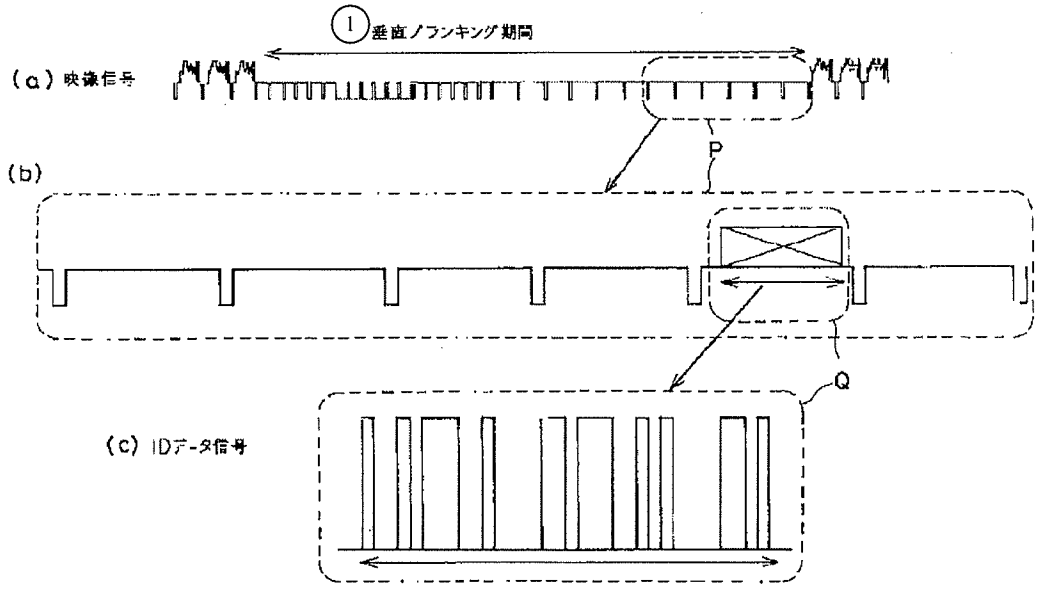


Figure 3

Key: (a) Video signal
(c) ID data signal
1 Vertical blanking period

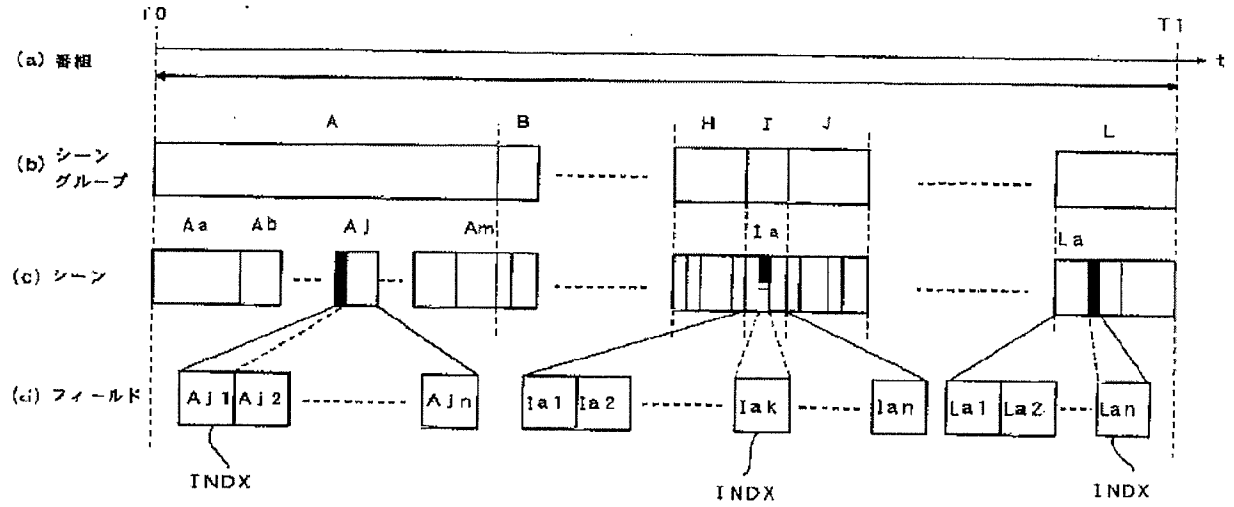


Figure 4

Key: (a) Program
(b) Scene group
(c) Scene
(d) Field

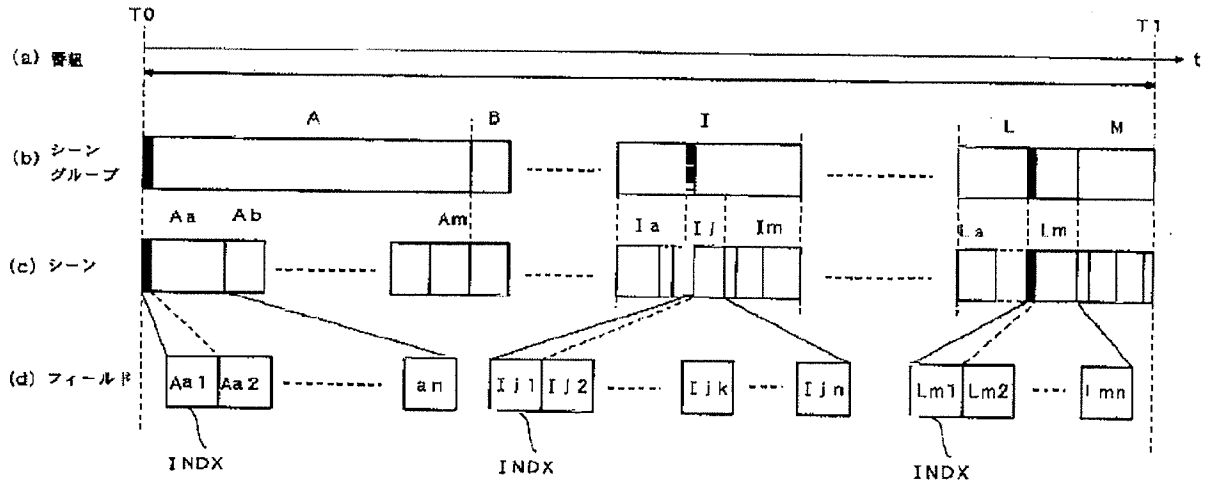


Figure 5

Key: (a) Program
(b) Scene group
(c) Scene
(d) Field

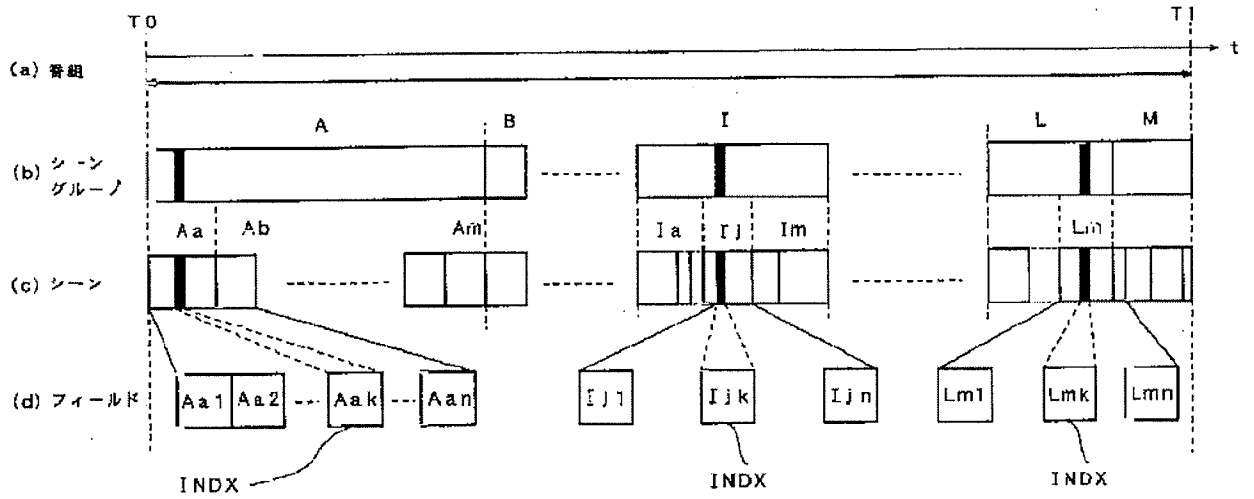


Figure 6

Key: (a) Program
(b) Scene group
(c) Scene
(d) Field

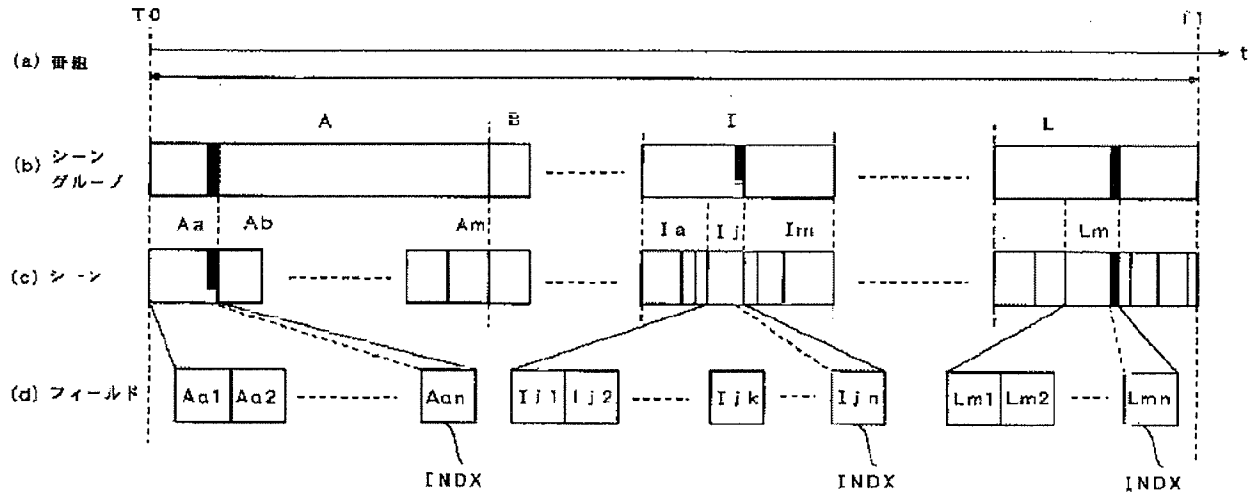


Figure 7

Key: (a) Program
(b) Scene group
(c) Scene
(d) Field

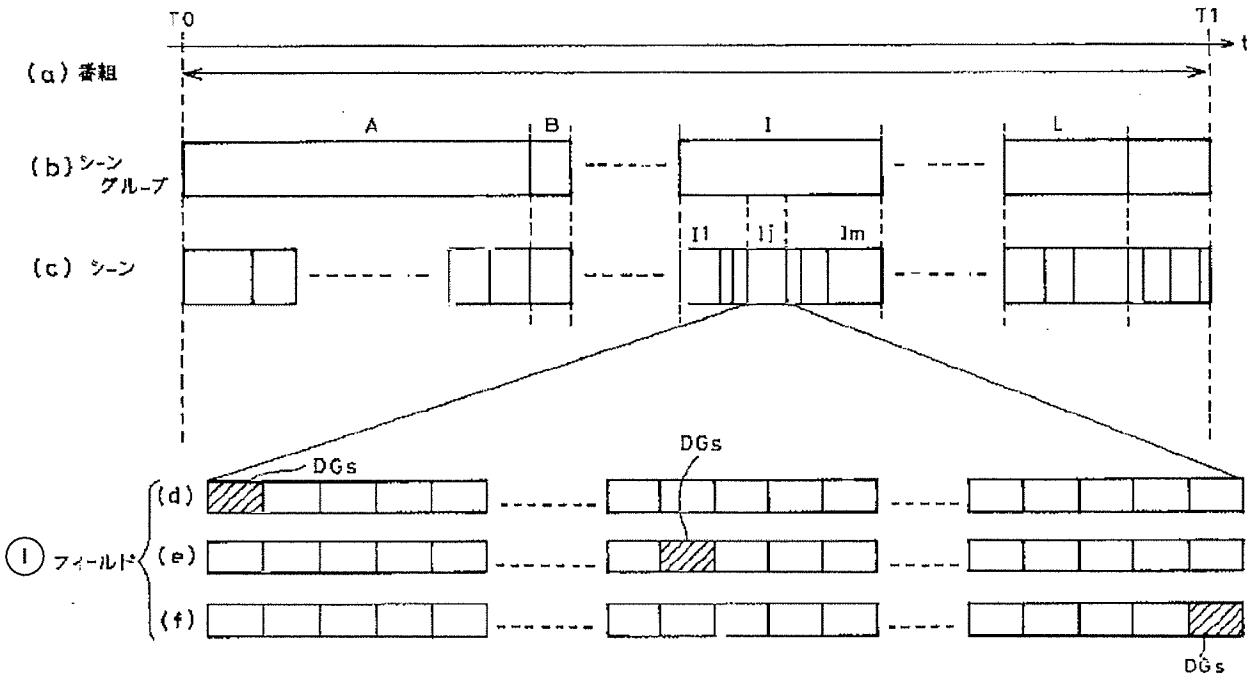


Figure 8

Key: (a) Program
(b) Scene group
(c) Scene
1 Field

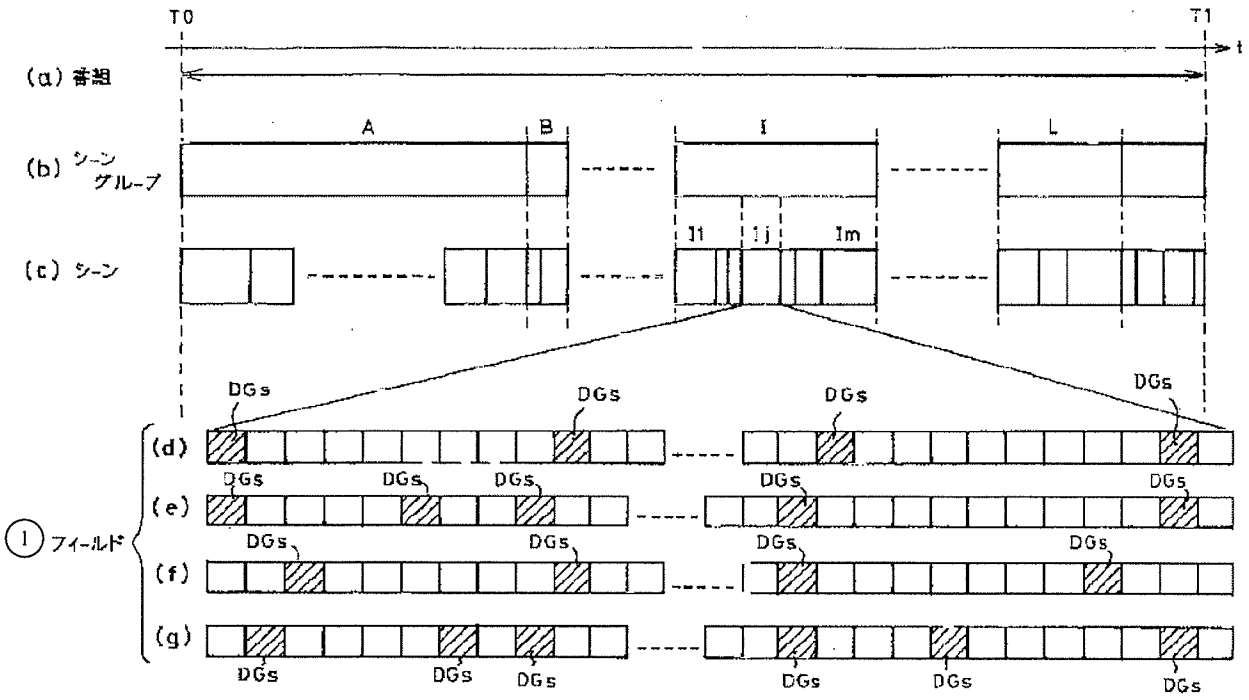


Figure 9

Key: (a) Program
(b) Scene group
(c) Scene
1 Field

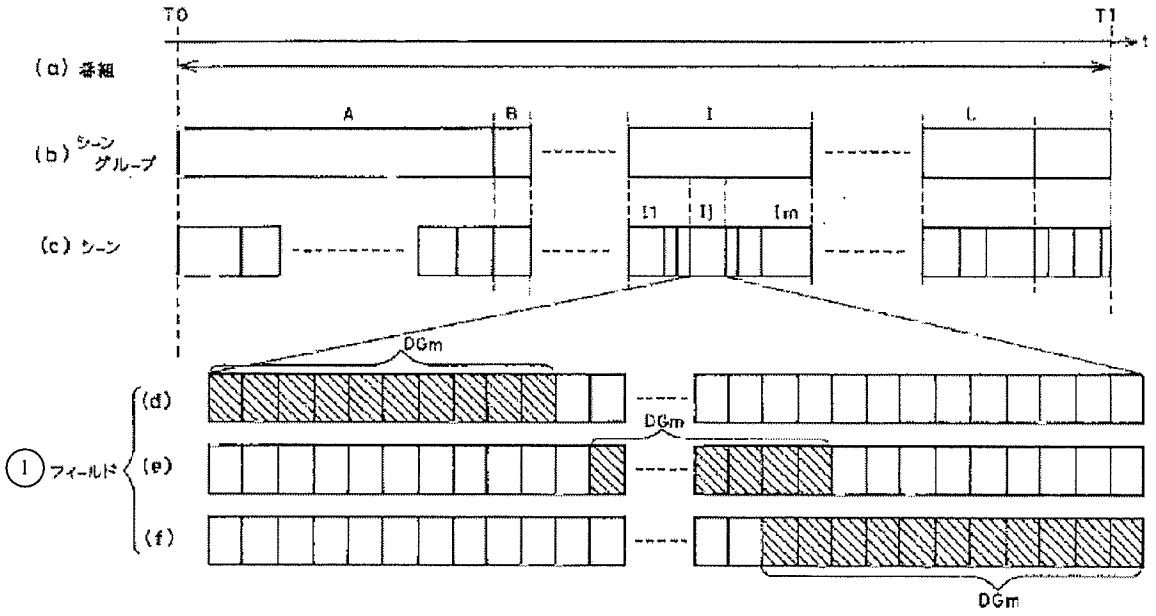


Figure 10

Key: (a) Program
(b) Scene group
(c) Scene
1 Field

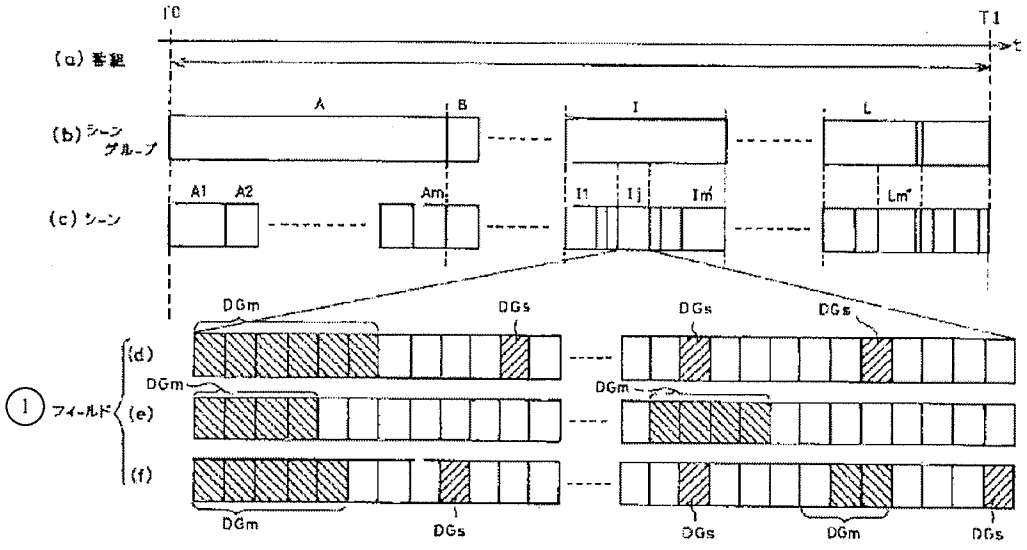


Figure 11

Key: (a) Program
(b) Scene group
(c) Scene
1 Field

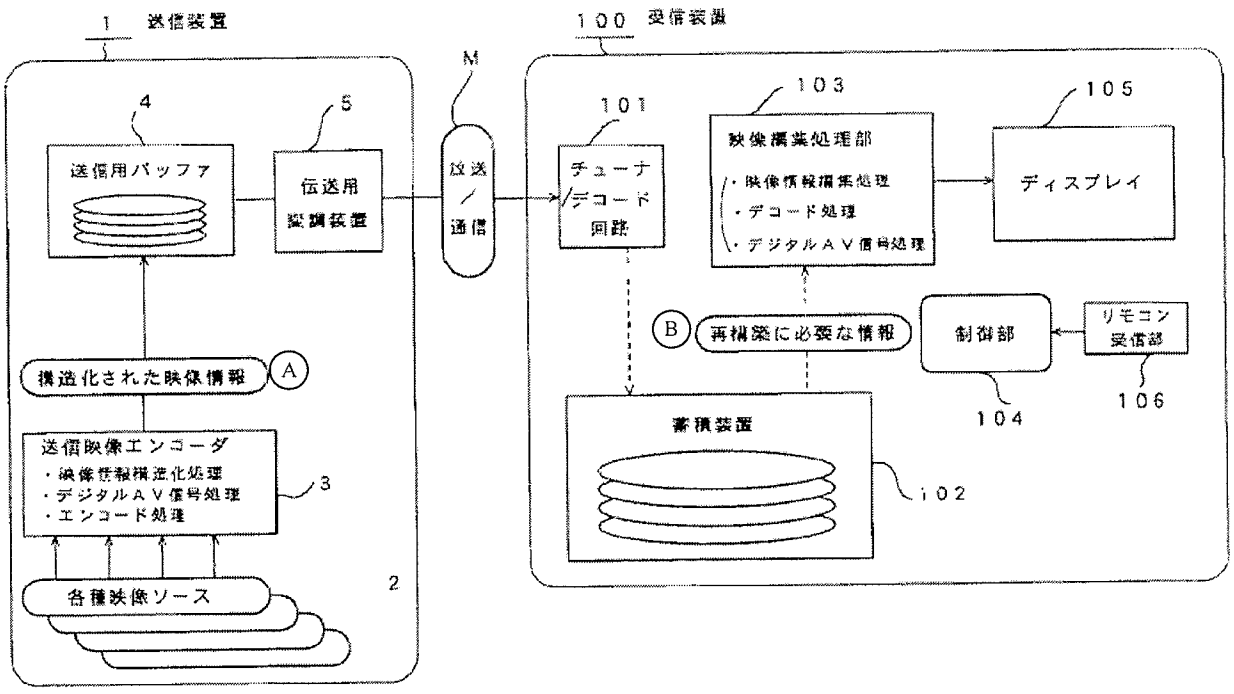


Figure 12

Key:
- A Structured video information
- B Information needed for restructuring
- M M Broadcast/communication
- 1 Transmitting equipment
- 2 Various kinds of video sources
- 3 Transmitted picture encoder
  - · Video information structuring processing
  - · Digital AV signal processing
  - · Encoding processing
- 4 Buffer for transmission
- 5 Modulator for transmission
- 100 Receiving equipment
- 101 Tuner/decoder
- 102 Storage device
- 103 Video editing part
  - · Video information editing
  - · Decoding processing
  - · Digital AV signal processing
- 104 Control part
- 105 Display
- 106 Remote control receiver

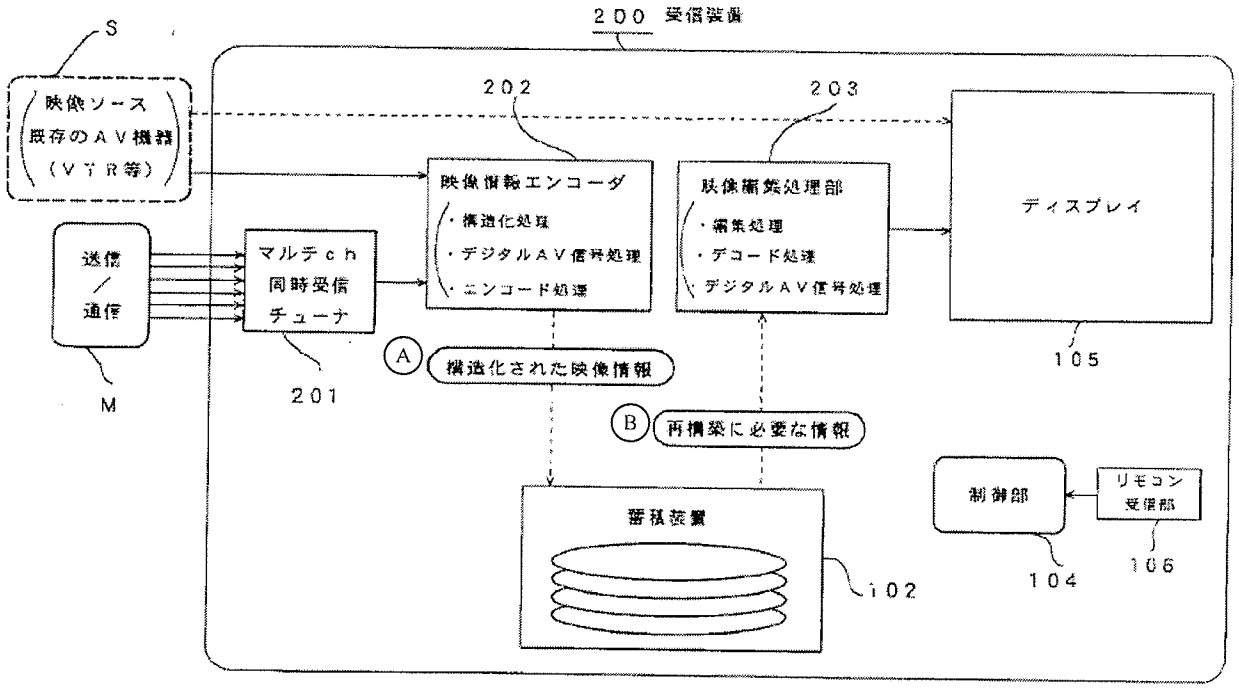


Figure 13

Key:
- A Structured video information
- B Information needed for re-structuring
- M Transmission/communication
- S Video source
  Existing AV machine (VTR or the like)
- 200 Receiving equipment
- 201 Multi-channel simultaneous reception tuner
- 202 Video information encoder
  · Structuring
  · Digital AV signal processing
  · Encoding
- 203 Video editing part
  · Editing
  · Decoding
  · Digital AV signal processing
- 105 Display
- 102 Storage device
- 104 Control part
- 106 Remote control reception part

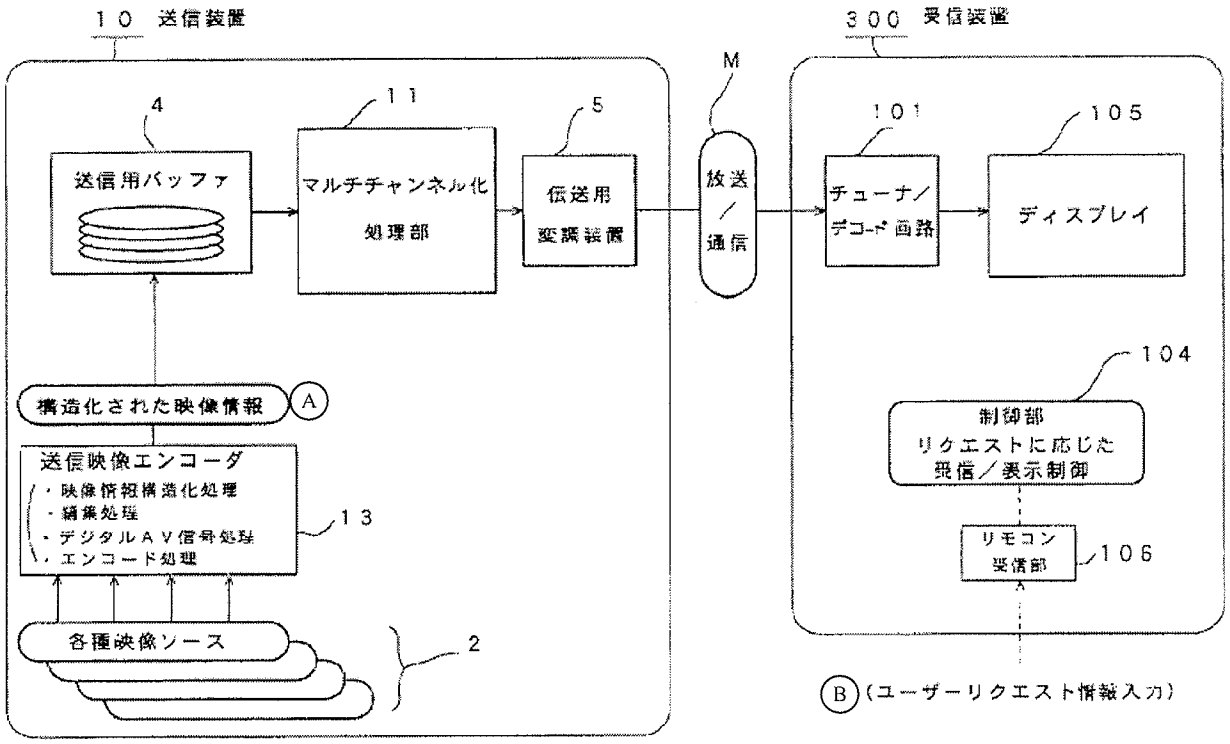


Figure 14

Key:
- A Structured video information
- B (User request information input)
- M Broadcast/communication
- 10 Transmitting equipment
- 2 Various kinds of video sources
- 13 Transmitted picture encoder
  - · Video information structuring processing
  - · Editing
  - · Digital AV signal processing
  - · Encoding processing
- 4 Buffer for transmission
- 5 Modulator for transmission
- 11 Multi-channeling part
- 101 Tuner/decoder
- 104 Control part
  Reception/display control corresponding to a request
- 105 Display
- 106 Remote control receiver
- 300 Receiving equipment

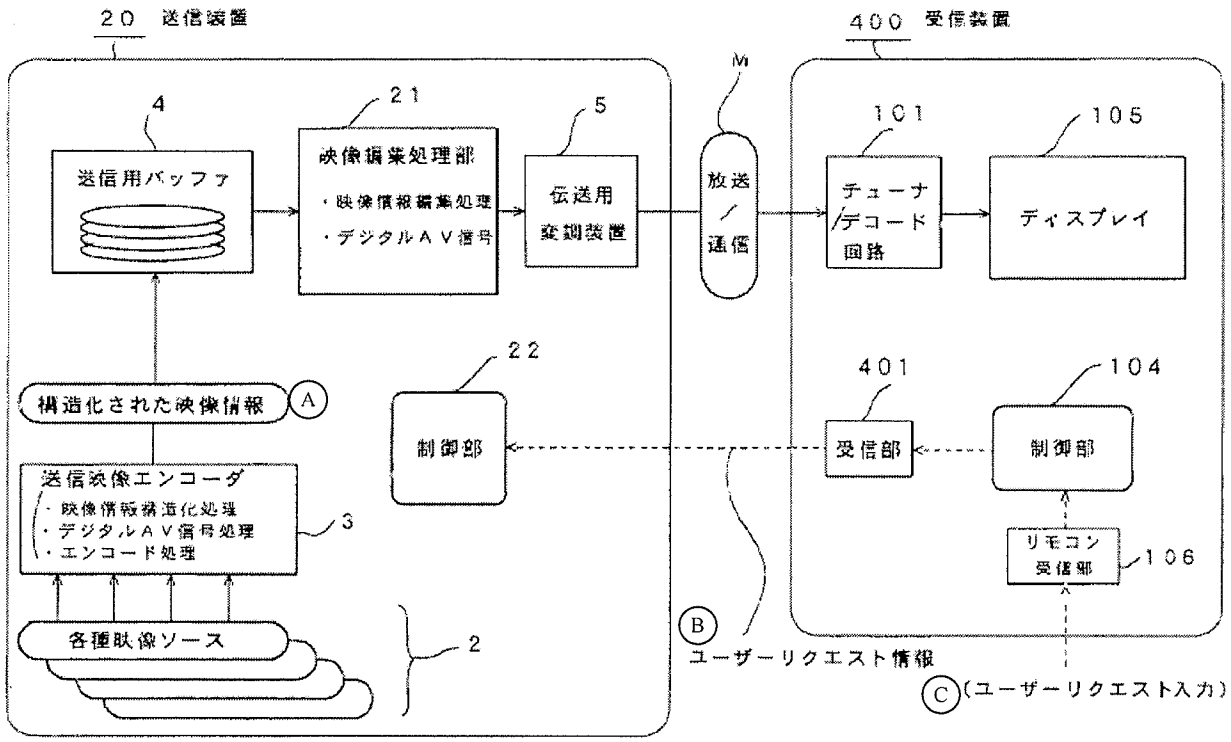


Figure 15

Key:
- A Structured video information
- B User request information
- C (User request input)
- M Broadcast/communication
- 20 Transmitting equipment
- 2 Various kinds of video sources
- 3 Transmitted picture encoder
  - · Video information structuring processing
  - · Digital AV signal processing
  - · Encoding processing
- 4 Buffer for transmission
- 5 Modulator for transmission
- 21 Video editing part
  - · Video information editing
  - · Digital AV signal
- 22 Control part
- 400 Receiving equipment
- 101 Tuner/decoder
- 104 Control part
- 105 Display
- 106 Remote control receiver
- 401 Reception part

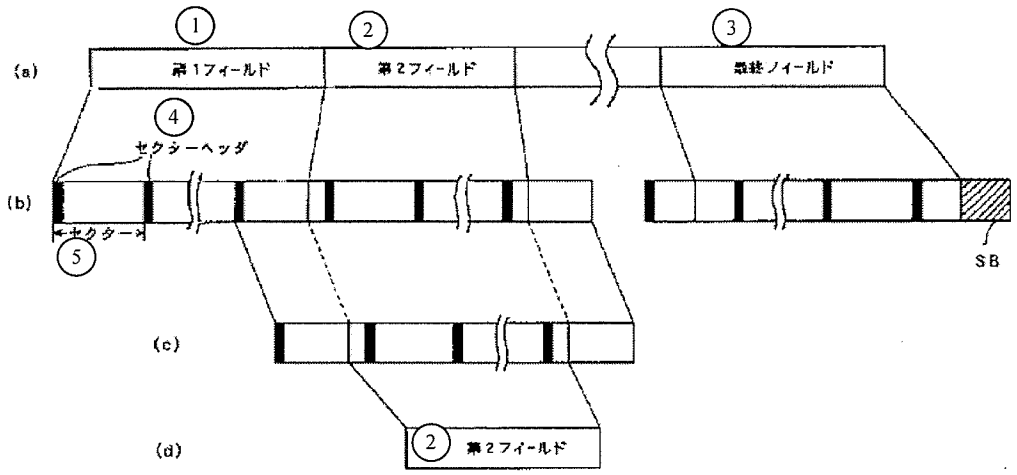


Figure 16

Key: 1 First field
2 Second field
3 Last field
4 Sector header
5 Sector

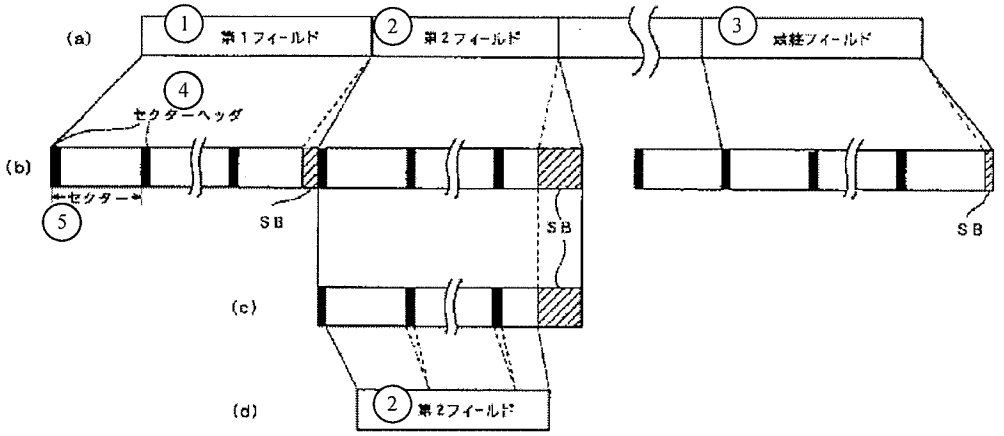


Figure 17

Key: 1 First field
2 Second field
3 Last field
4 Sector header
5 Sector

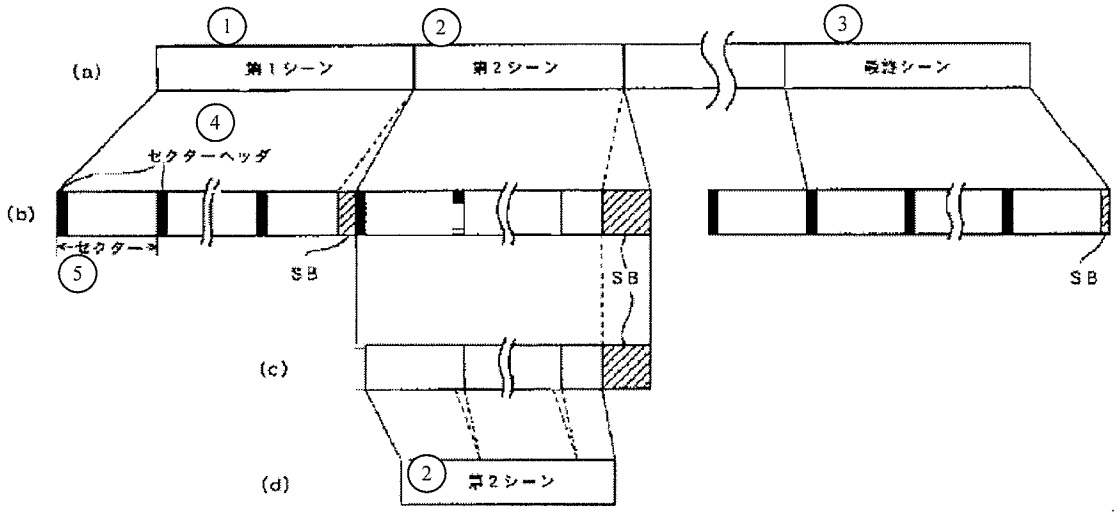


Figure 18

Key: 1 First field
2 Second scene
3 Last scene
4 Sector header
5 Sector

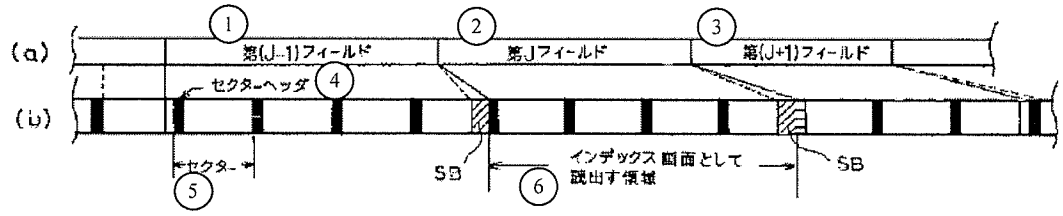


Figure 19

Key: 1 (J-1)th field
2 Jth field
3 (J+1)th field
4 Sector header
5 Sector
6 Reading region as index screen

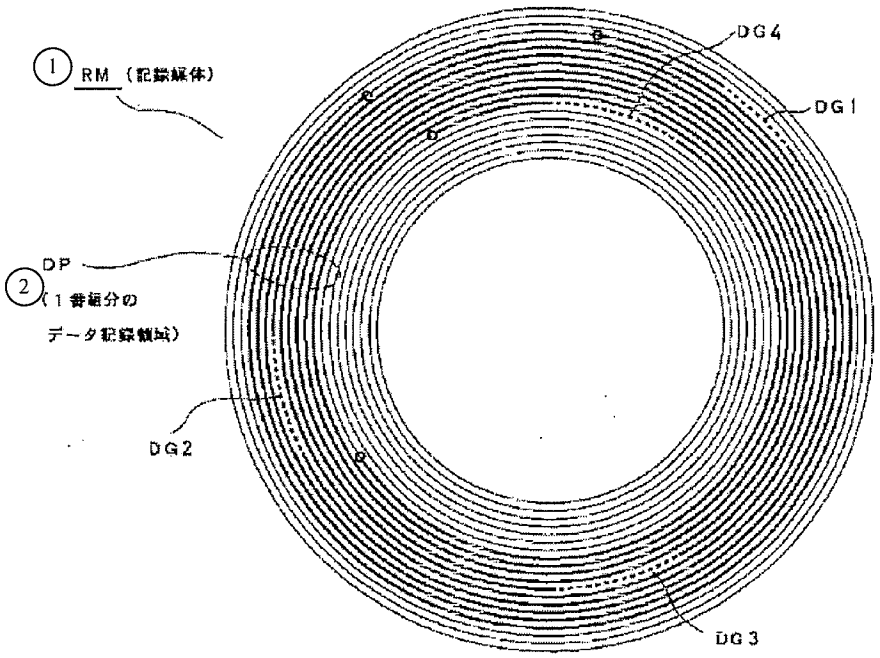


Figure 20

Key: 1 RM (recording medium)
2 DP (data recording region for 1 program)

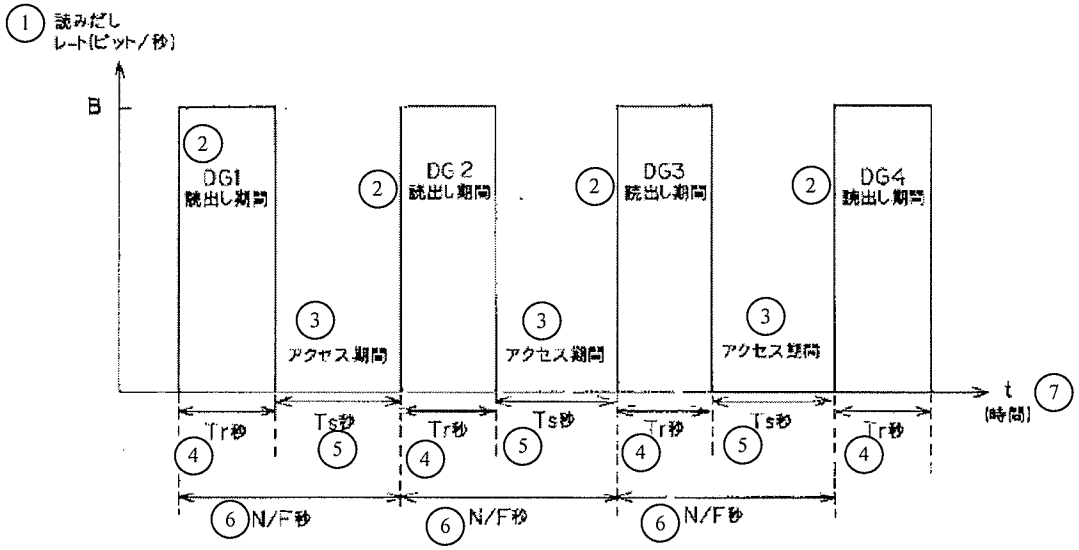


Figure 21

Key: 1 Reading rate (bits/sec)
2 ___ reading period
3 Access period
4 Tr sec
5 Ts sec

6 N/F sec
7 (Time)

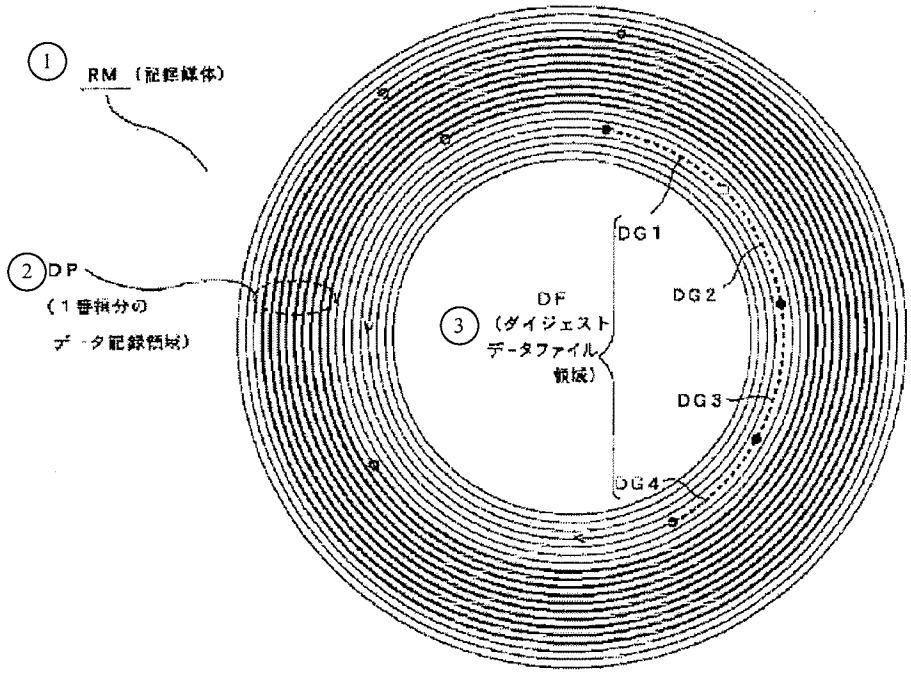


Figure 22

Key: 1 RM (recording medium)
2 DP (data recording region for 1 program)
3 DF (digest data file region)

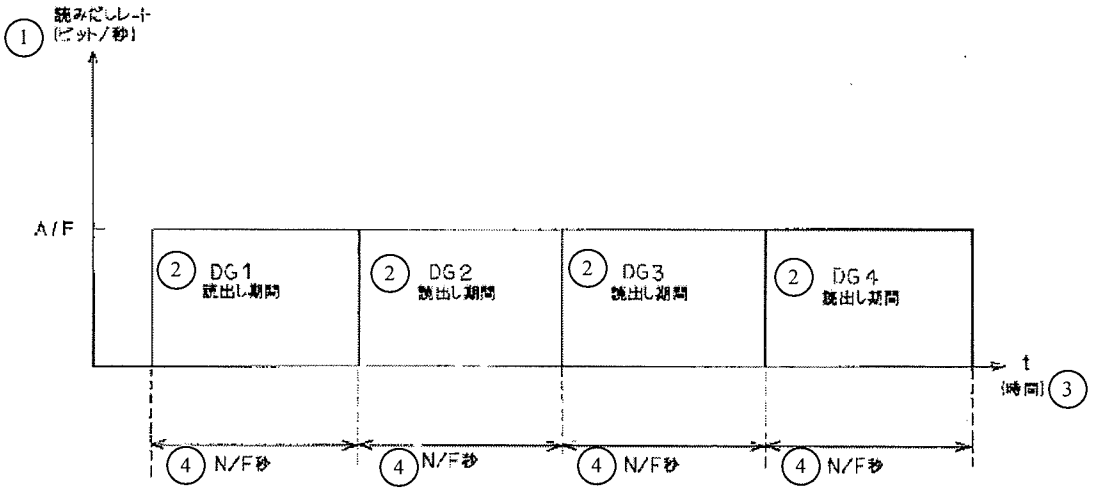


Figure 23

Key: 1 Reading rate (bits/sec)
2 ___ reading period
3 (Time)
4 N/F sec

Continued from front page

(51) Int. Cl.[5]: Identification Codes: FI
H 04 N 5/91 J